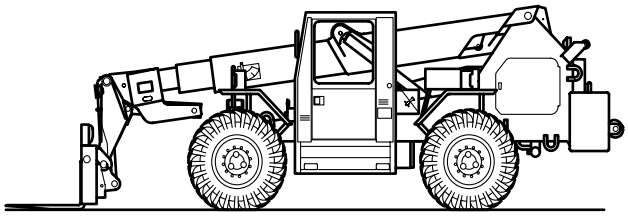
TECHNICAL MANUAL

OPERATOR'S MANUAL



ALL TERRAIN LIFTER ARMY SYSTEM (ATLAS)

10,000 LB CAPACITY

NSN 3930-01-417-2886

Approved for public release; distribution is unlimited.

INTRODUCTION	1-1
OPERATING INSTRUCTIONS	2-1
PREVENTIVE MAINTENANCE	2-16
OPERATION PROCEDURES	2-31
OPERATION UNDER UNUSUAL CONDITIONS	2-63
OPERATOR MAINTENANCE INSTRUCTIONS	3-1
TROUBLESHOOTING PROCEDURES	3-1
OPERATOR MAINTENANCE PROCEDURES	3-7
REFERENCES	A-1
COMPONENTS OF END ITEMS (COEI) AND BASIC ISSUE ITEMS (BII) LISTS	B-1
ADDITIONAL AUTHORIZATION LIST	C-1
EXPENDABLE/DURABLE SUPPLIES AND MATERIALS LIST	D-1
LOAD RATING CHART	E-1
TRANSPORTABILITY INSTRUCTIONS	F-1
ALPHABETICAL INDEX	Index-1

HEADQUARTERS, DEPARTMENT OF THE ARMY

MAY 1998

WARNING

- DO NOT STOP QUICKLY. It is possible to drop a load which could result in load damage, or injury or death to personnel.
- Do not downshift at high speeds. Vehicle will slow suddenly which could result in load damage, or injury or death to personnel.
- Do not turn fast. This may cause forklift to tip, lose the load, and possibly cause injury or death to personnel. This is particularly true in the four wheel steering mode. Turn vehicle in a lower gear or a slower speed.

WARNING

- Do not travel with the automatic fork level switch in the ON position. It is possible to drop a load which could result in load damage, or injury or death to personnel.
- Use care when backing up. Have someone direct you if you cannot see where you are going. Watch clearances. Failure to do so can result in load damage, or injury or death to personnel.
- Do not operate vehicle with the emergency steer switch in the OFF position. If engine power is lost, there will also be a loss of emergency steering capability. Failure to follow this precaution could result in injury or death to personnel.

WARNING

- Use care when handling and transporting ammunition pallets. Failure to do so could result in injury or death to personnel.
- Never move any part of vehicle or load near a power line or overhead wires. Failure to follow this precaution could result in immediate injury or death to personnel.
- Ensure that counterweights are in place. An unbalanced vehicle could tip over and could cause injury or death to personnel.
- Always lift load from its resting spot before extending or retracting the boom. Always extend or retract the boom before lowering load to its resting spot. Failure to do so could cause vehicle instability and result in injury or death to personnel. Refer to Appendix E for Load Rating Chart.
- Do not lift more than one pallet with forks. Pallets may topple and result in load or vehicle danger or injury or death to personnel.
- Always retract the boom before lowering or transporting a load. Failure to do so could cause vehicle instability and result in injury or death to personnel.

WARNING

- Do not exceed 45% grade (25°) longitudinally. Vehicle becomes unstable as fluid levels are shifted. Internal components may not be properly lubricated causing vehicle damage. Tires may slip (loss of traction) or vehicle may tip, resulting in possible operator injury or death.
- Do not exceed 30% grade (17°) laterally. Vehicle becomes unstable as fluid levels are shifted. Internal components may not be properly lubricated causing vehicle damage. Tires may slip (loss of traction) or vehicle may tip, resulting in possible operator injury or death.
- Travel on inclines, slopes, ramps and grades only as follows:
  - — Loaded Forklift: with forks (and load) pointing uphill.
  - — Empty Forklift: with forks pointing downhill.

WARNING

When the ATLAS is being operated without counterweight, care must be taken to avoid tipping the vehicle over. Boom extension must be kept at a minimum. Failure to comply could result in serious injury or death to personnel.

WARNING

Fuel is very flammable and can explode easily. To avoid serious injury or death:

- Keep fuel away from open flame or any spark (ignition source).
- Keep at least a B-C fire extinguisher within easy reach when working with fuel or on a fuel system.
- Do not work on fuel system when engine is hot; fuel can be ignited by a hot engine.
- Post signs that read “NO SMOKING WITHIN 50 FEET (15 m)” when working with open fuel, fuel lines or fuel tanks.

WARNING

Use extreme care when lifting counterweight with forklift. Counterweights weigh 5800 lbs (2633.2 kg) and its center of gravity (CG) is off center. Never allow forks to tip forward. Always tie counterweight lifting eyes to the lifting forklift. Counterweight must be handled using another 10K ATLAS/10K carriage and lifted through lifting eyes located at the top of the counterweight. Keep hands or fingers out of holes for counterweight pins. Failure to comply could result in serious injury or death to personnel.

WARNING

CARBON MONOXIDE (EXHAUST GAS) CAN KILL YOU.

Carbon monoxide is a colorless, odorless, DEADLY POISONOUS gas and, when breathed, deprives body of oxygen and causes SUFFOCATION. Breathing air with carbon monoxide produces symptoms of headache, dizziness, loss of muscular control, a sleepy feeling, and coma. Permanent BRAIN DAMAGE or DEATH can result from severe exposure.

The following precautions MUST be followed to ensure personnel are safe whenever arctic heater or engine is operated for any purpose. Otherwise, injury to personnel may result.

- DO NOT operate arctic heater or vehicle engine in enclosed area without adequate ventilation.
- BE ALERT at all times during vehicle operation for exhaust symptoms. If symptoms are present, IMMEDIATELY EVACUATE AND VENTILATE the area. Treat affected personnel as follows: expose to fresh air; keep warm; DO NOT PERMIT PHYSICAL EXERCISE; if necessary, give artificial respiration as described in FM 4-25.11 and get medical attention.
- BE AWARE; neither the gas particulate filter unit nor field protection mask for nuclear-biological-chemical protection will protect you from carbon monoxide poisoning.

THE BEST DEFENSE AGAINST CARBON MONOXIDE POISONING IS GOOD VENTILATION.

WARNING

- Dry cleaning solvent MIL-PRF-680 Type III is an environmentally compliant and low toxic material. However, it may be irritating to the eyes and skin. The use of protective gloves and goggles is suggested. Use in well-ventilated areas. Keep away from open flames and other sources of ignition.
- NOTE: P-D-680 Type II is no longer in use and has been replaced by MIL-PRF-680 Type III.

WARNING

Personnel hearing can be PERMANENTLY DAMAGED if exposed to constant high noise levels of 85 dB (A) or greater. Wear approved hearing protection devices when operating or working within 61 ft (19 m) of vehicle when engine is running. Personnel exposed to high noise levels shall participate in a hearing conservation program in accordance with TB MED 501. Hearing loss occurs gradually but becomes permanent over time.

TM 10-3930-673-10
C2

TECHNICAL MANUAL
TM 10-3930-673-10
Change 2

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON D.C., 15 FEBRUARY 2009

OPERATOR'S MANUAL

FOR

ALL TERRAIN LIFTER ARMY SYSTEM (ATLAS)
10,000 LB CAPACITY

(NSN 3930-01-417-2886)

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Index-1 thru Index-2	Index-1 thru Index-2
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TECHNICAL MANUAL
TM 10-3930-673-10
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HEADQUARTERS
DEPARTMENT OF THE ARMY
Washington, D.C., 30 November 2005

OPERATOR'S MANUAL

FOR

ALL TERRAIN LIFTER ARMY SYSTEM (ATLAS)
10,000 LB CAPACITY

(NSN 3930-01-417-2886)

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2-17 and 2-18	*2-17 and 2-18*
	2-18.1 thru 2-18.3/(2-18.4 blank)
2-21 thru 2-30	*2-21 thru 2-30*
2-61 and 2-62	*2-61 and 2-62*
2-67 thru 2-70	*2-67 thru 2-70*
2-75 thru 2-88	*2-75 thru 2-88*
3-7 and 3-8	*3-7 and 3-8*
A-1 and A-2	*A-1 and A-2*
B-1 and B-2	*B-1 and B-2*
C-1 and C-2'	*C-1 and C-2*
D-1 and D-2	*D-1 thru D-3/(D-4 blank)*
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Dates of issue for original and change pages are:

Original - 4 May 1998
Change 1 - 30 November 2005
Change 2 - 15 February 2009

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ii/(iv blank)	2	F-1 to F-4	0
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2-1	1	F-6	0
2-2 to 2-16	0	F-7 to F-12	1
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2-19	0	Index-1	2
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2-22	0	Auth. Page (Back blank)	0
2-23 to 2-24	1	Sample 2028-2	0
2-25	0	Three Blank 2028-2s	0
2-26 to 2-28	1	Metric Conversion Chart	0
2-29	0	Back Cover	0
2-30	1		
2-31 to 2-60	0		
2-61 to 2-62	1		
2-63 to 2-66	0		
2-67 to 2-70	1		
2-71 to 2-75	0		
2-76	1		
2-77	0		
2-78 to 2-87	1		
2-88	0		
3-1 to 3-6	0		
3-7 to 3-8	1		
3-9 to 3-15/(3-16 blank)	0		
A-1 to A-2	1		
B-1 to B-4	2		

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TECHNICAL MANUAL
No. 10-3930-673-10

HEADQUARTERS
DEPARTMENT OF THE ARMY
Washington, DC, 4 MAY 1998

OPERATOR'S MANUAL

FOR

ALL TERRAIN LIFTER ARMY SYSTEM (ATLAS)

10,000 LB CAPACITY

NSN 3930-01-417-2886

REPORTING OF ERRORS AND RECOMMENDING IMPROVEMENTS
You can help improve this manual. If you find any discrepancies or know a way to improve this TM, let us know. Mail your letter, DA Form 2028 (Recommended Changes to Publications) or DA Form 2028-2 located in the back of this manual to: Commander, US Army Tank-automotive and Armaments Command, Attn: AMSTA-AC-NML, Rock Island, IL 61299-7630. A reply will be furnished to you. You can also provide DA Form 2028-2 information to TACOM via datafax or e-mail. TACOM's datafax number is: DSN 793-0726 or (309) 782-0726. E-mail address: amsta-ac-nml@ria-ehm 2.army.mil.

TABLE OF CONTENTS

		Page
	HOW TO USE THIS MANUAL	iii
CHAPTER 1	INTRODUCTION	1-1
Section I.	General Information	1-1
Section II.	Equipment Description and Data	1-3
Section III.	Technical Principles of Operation	1-7
CHAPTER 2	OPERATING INSTRUCTIONS	2-1
Section I.	Description and Use of Operator's Controls and Indicators	2-1
Section II.	Preventive Maintenance	2-16
Section III.	Operation Procedures	2-31
Section IV.	Operation Under Unusual Conditions	2-63
CHAPTER 3	OPERATOR MAINTENANCE INSTRUCTIONS	3-1
Section I.	Lubrication Instructions	3-1
Section II.	Troubleshooting Procedures	3-1

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TABLE OF CONTENTS (CONT)

		Page
Section III.	Operator Maintenance Procedures	3-7
APPENDIX A	REFERENCES	A-1
APPENDIX B	COMPONENTS OF END ITEM (COEI) AND BASIC ISSUE ITEMS (BII) LISTS	B-1
Section I.	Introduction	B-1
Section II.	Components of End Item	B-2
Section III.	Basic Issue Items	B-3
APPENDIX C	ADDITIONAL AUTHORIZATION LIST	C-1
Section I.	Introduction	C-1
Section II.	Additional Authorization List	C-2
APPENDIX D	EXPENDABLE/DURABLE SUPPLIES AND MATERIALS LIST	D-1
Section I.	Introduction	D-1
Section II.	Expendable/Durable Supplies and Materials List	D-2
APPENDIX E	LOAD RATING CHART	E-1
APPENDIX F	TRANSPORTABILITY INSTRUCTIONS	F-1
	ALPHABETICAL INDEX	Index-1

HOW TO USE THIS MANUAL

This manual is designed to help maintain the All Terrain Lifter Army System (ATLAS), 10,000 Lb Capacity, NSN 3930-01-417-2886. Listed below are some of the special features that have been included to help locate and use the needed information:

A front cover Table of Contents is provided for quick reference to chapters and appendixes that will be used often.

Warning, caution, and note headings, subject headings, and certain other essential information are printed in bold type to make them easier to see.

In addition to text, there are exploded-view illustrations showing the location of the item being discussed and/or showing how to take a component off and put it back on.

Chapter 1 of this manual describes the ATLAS and provides equipment data.

Chapter 2 of this manual covers operator's controls and indicators, preventive maintenance and operating procedures.

Chapter 3 of this manual covers instructions for troubleshooting and operator maintenance instructions.

Appendix A lists any references used in this manual.

Appendix B contains the Components of End Item and Basic Issue Items Lists.

Appendix C covers any Additional Authorized Items for the ATLAS.

Appendix D shows any Expendable and Durable Items required for operating the ATLAS.

Appendix E contains the Load Rating Chart for the ATLAS.

Appendix F contains transportability instructions for the ATLAS.

An alphabetical index is provided to help locate main items in the text.

FOLLOW THESE GUIDELINES WHEN USING THIS MANUAL:

The operator must read through this manual and become familiar with the contents before attempting to operate the ATLAS.

Read all WARNINGS and CAUTIONS before performing any procedure.

CHAPTER 1
INTRODUCTION

Para	Contents	Page
	Section I. General Information	
1-1.	Scope	1-1
1-2.	Maintenance Forms and Records	1-2
1-3.	Corrosion Prevention and Control (CPC)	1-2
1-4.	Destruction of Army Material to Prevent Enemy Use	1-2
1-5.	Reporting Equipment Improvement Recommendations (EIR's)	1-2
1-6.	Equipment Improvement Report and Maintenance Digest (EIR MD)	1-2
1-7.	List of Abbreviations	1-3
	Section II. Equipment Description and Data	
1-8.	Equipment Characteristics, Capabilities, and Features	1-3
1-9.	Location and Description of Major Components	1-4
1-10.	Equipment Data	1-6
	Section III. Technical Principles of Operation	
1-11.	General	1-7
1-12.	Fuel System	1-8
1-13.	Engine Lubrication and Cooling Systems	1-9
1-14.	Transmission Lubrication and Cooling Systems	1-11
1-15.	Steering and Brake System	1-12
1-16.	Electrical System	1-13
1-17.	Hydraulic System	1-14

Section I. GENERAL INFORMATION

1-1. SCOPE

a. Type of Manual. This manual contains operation and operator maintenance instructions for the ATLAS.

b. Equipment Name and Model Number. The ATLAS (All Terrain Lifter Army System) Forklift Truck, SKYTRAK 10000M, NSN 3930-01-417-2886, is equipped with a 6,000 lb and a 10,000 lb lifting carriage. The vehicle is manufactured by TRAK International, Inc.

c. Purpose of Equipment. The ATLAS is designed for loading and unloading munitions and other palletized items from transport vehicles and containers. The ATLAS is also designed for use as a standard rough terrain forklift.

d. Special Limitations on Equipment. The ATLAS has no special limitations. Normal limitations such as travel speed, lift capacity, etc., are discussed in Para 1-10.

1-2. MAINTENANCE FORMS AND RECORDS

Department of the Army forms and procedures used for equipment maintenance will be those prescribed by DA Pam 738-750, The Army Maintenance Management System (TAMMS).

1-3. CORROSION PREVENTION AND CONTROL (CPC)

Corrosion Prevention and Control (CPC) of Army materials is a continuing concern. It is important that any corrosion problems with the forklift be reported so that the problem can be corrected and improvements can be made to prevent the problem in the future.

While corrosion is typically associated with rusting of metals, corrosion can also include deterioration of other materials, such as rubber and plastic. Unusual cracking, softening, swelling, or breaking of these materials may be a corrosion problem.

If a corrosion problem is identified, it can be reported using Standard Form 368, Product Quality Deficiency Report. Use of key words such as “corrosion, rust, deterioration, and cracking” will ensure that the information is identified as a CPC problem.

1-4. DESTRUCTION OF ARMY MATERIAL TO PREVENT ENEMY USE

Command decision, according to the tactical situation, will determine when the destruction of the forklift will be accomplished. A destruction plan will be prepared by the using organization unless one has been prepared by a higher authority. For general destruction procedures for this equipment, refer to TM 750-244-6, Procedures for Destruction of Tank-Automotive Equipment to Prevent Enemy Use (US Army Tank-automotive and Armaments Command).

1-5. REPORTING EQUIPMENT IMPROVEMENT RECOMMENDATIONS (EIR'S)

If your ATLAS needs improvement, let us know. Send us an EIR. You, the user, are the only one who can tell us what you don’t like about your equipment. Let us know why you don’t like the design or performance. Put it on an SF368 (Product Quality Deficiency Report). Mail it to us at: Commander, US Army Tank-automotive and Armaments Command, ATTN: AMSTA-TR-E/MPA, Warren, MI 48397-5000. A reply will be furnished to you.

1-6. EQUIPMENT IMPROVEMENT REPORT AND MAINTENANCE DIGEST (EIR MD)

The quarterly Equipment Improvement Report and Maintenance Digest, TB 43-0001-39 series, contains valuable field information on the equipment covered in this manual. The information in the TB 43-0001-39 series is compiled from some of the Equipment Improvement Reports that you prepared on the vehicles covered in this manual. Many of these articles result from comments, suggestions, and improvement recommendations that you submitted to the EIR program. The TB 43-0001-39 series contains information on equipment improvements, minor alterations, proposed Modification Work Orders (MWOs), warranties (if applicable), actions taken on some of your DA Forms 2028-2 (Recommended Changes to Publications), and advance information which will help you in doing your job better and will help in keeping you advised of the latest changes to this manual. Also refer to DA PAM 310-1, Consolidated Index of Army Publications and Blank Forms, and Appendix A, References, of this manual.

1-7. LIST OF ABBREVIATIONS

This list consists of special or unique abbreviations, acronyms or descriptors not contained in MIL-STD-12.

Abbreviation	Description
ATLAS	All Terrain Lifter, Army System
ROPS	Roll Over Protective Structure
FOPS	Falling Object Protective Structure

Section II. EQUIPMENT DESCRIPTION AND DATA

1-8. EQUIPMENT CHARACTERISTICS, CAPABILITIES, AND FEATURES

a. Purpose. The ATLAS is designed for loading and unloading munitions and other palletized items from transport vehicles and containers. Also, the ATLAS can be used as a forklift truck.

b. Equipment Characteristics, Capabilities, and Features.

(1) The ATLAS can handle boxes, palletized ammunition loads, and other palletized items from transport vehicles and containers.

(2) The vehicle frame can be tilted 9 degrees to left or right which allows vehicle to be level when traversing a sideslope.

(3) The attachment can be raised to a nearly horizontal position for loading and unloading munitions.

(4) The forks tilt, level, and sideshift to maneuver loads.

(5) With 6K carriage, lifts loads of 6,000 lbs to a height of 28 ft. With 10K carriage, lifts loads of 4,000 lbs to a height of 27.5 ft, and 10,000 lbs to a height of 17 ft.

(6) Can tow other vehicles weighing 33,500 pounds or less.

(7) The operator can select one of three steering modes: two wheel, four wheel, and crab wheel.

(8) The ATLAS is all weather operational.

(9) Can ford in up to 36 inches of water.

(10) Maximum speed of 23 mph over level ground with evenly distributed load.

1-9. LOCATION AND DESCRIPTION OF MAJOR COMPONENTS

a. Right Side View of the ATLAS.

RADIATOR. Contains coolant which provides engine cooling.

BOOM HOIST CYLINDER. Raises and lowers the boom.

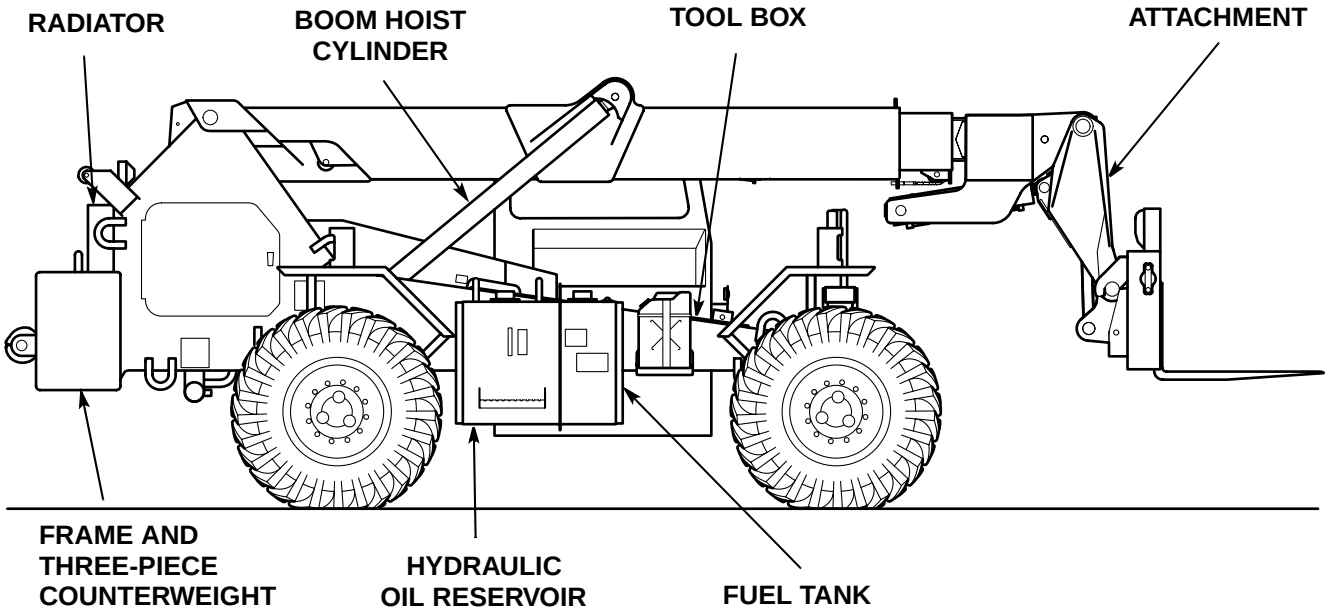
ATTACHMENT. The attachment is required for all forklift operations. The attachment can be raised to a nearly horizontal position, creating a low profile and extended reach configuration. This configuration is useful in loading and unloading munitions from transport vehicles and containers.

FUEL TANK. Contains diesel fuel or JP-8 for engine operation.

HYDRAULIC OIL RESERVOIR. Contains hydraulic fluid for the hydraulic system.

FRAME AND THREE-PIECE COUNTERWEIGHT. The frame is a heavy-duty design constructed of 1-3/16 in. thick steel plates. The frame is equipped with tie-down lugs meeting air transport specifications, tow lugs, a pintle hook, and a 5800 lb three-piece counterweight. The counterweight is self removable so that axle loading can be adjusted to meet air transport requirements for some aircraft.

TOOL BOX. Storage area for tools and basic issue items.



b. Left Side View of the ATLAS.

FORKS AND CARRIAGE. Serve as an anchoring point of the forks. Importantly, the fork carriage is equipped with automatic fork leveling. Moving a switch will keep the forks level when raising or lowering the boom. ATLAS 6K carriage has a hinged backrest. Remove the pins to tip it to the low profile position.

BOOM. The telescopic, three stage boom is constructed of welded high strength steel. The boom will retract or extend the reach and height of the forks.

BOOM ANGLE INDICATOR. Shows the angle of the boom relative to the horizon.

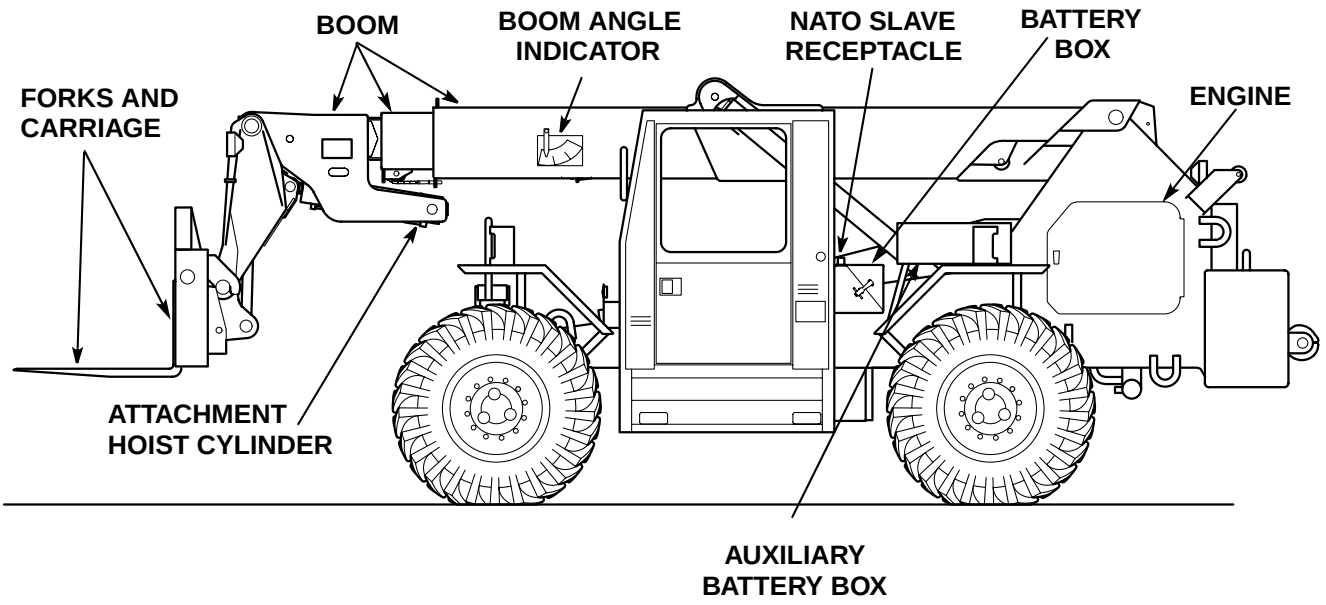
NATO SLAVE RECEPTACLE. Connection point for starting a disabled vehicle or for receiving starting assistance when disabled.

BATTERY BOX. Holds the batteries which provide current for the electric system.

AUXILIARY BATTERY BOX. Holds the batteries which provide auxiliary current for the arctic heater. Not present on all vehicles.

ENGINE. Provides the necessary power to drive the transmission. The engine also contains sending units for the Simplified Test Equipment for Internal Combustion Engines (STE/ICE) diagnostics.

ATTACHMENT HOIST CYLINDER. Moves the attachment forward and back.



1-10. EQUIPMENT DATA

Table 1-1 lists data for the ATLAS.

Table 1-1. Equipment Data

ENGINE:

Model	6BT5.9-C165
Manufacturer	Cummins
Horsepower (2,500 rpm)	165 hp
Number of Cylinders	6
Displacement	359 $in.^3$
Weight	930 lb
Maximum No Load RPM	2650 to 2750 rpm

TRANSMISSION:

Model	1723
Manufacturer	Funk
Powershift	3 speed forward and reverse
Speed Range	
First Gear	0-4 mph, level surface
Second Gear	0-8 mph, level surface
Third Gear	0-23 mph, level surface
Weight	846 lb

AXLES AND BRAKES:

Model (Front)	PSOC-205-HDB-231
Model (Rear)	PSOC-205-HDB-232
Manufacturer	Rockwell
Weight - Axle Assembly (Front or Rear)	1,650 lb

DIMENSIONS AND WEIGHT:

Vehicle Operational Weights:	
With 6K carriage	31,300 lb
With 10 K carriage	32,600 lb
Roading (both carriages)	33,500 lb
Boom Assembly Weight	5,165 lb
Inner Boom Weight	1,280 lb
Intermediate Boom Weight	955 lb
Outer Boom Weight	1,950 lb
Boom Extend Cylinder	600 lb
Max Length in Carry Position:	
With 6K carriage	324.2 in.
With 10K carriage	356.3 in.
Roading	356.3 in.
Width	100.2 in.
Max Height	107 in.
Track Width (Tread)	80.3 in.

Table 1-1 Equipment Data (Cont)

CAPACITIES:

Fuel Tank	44 gal
Cooling System	8 gal
Hydraulic Oil Reservoir	56.6 gal
Hydraulic System	75 gal
Engine Crankcase	15 qt
Engine Crankcase w/filter cap	15.3 qt
Transmission	5.5 gal
Transmission w/filter cap	5.75 gal

MISCELLANEOUS:

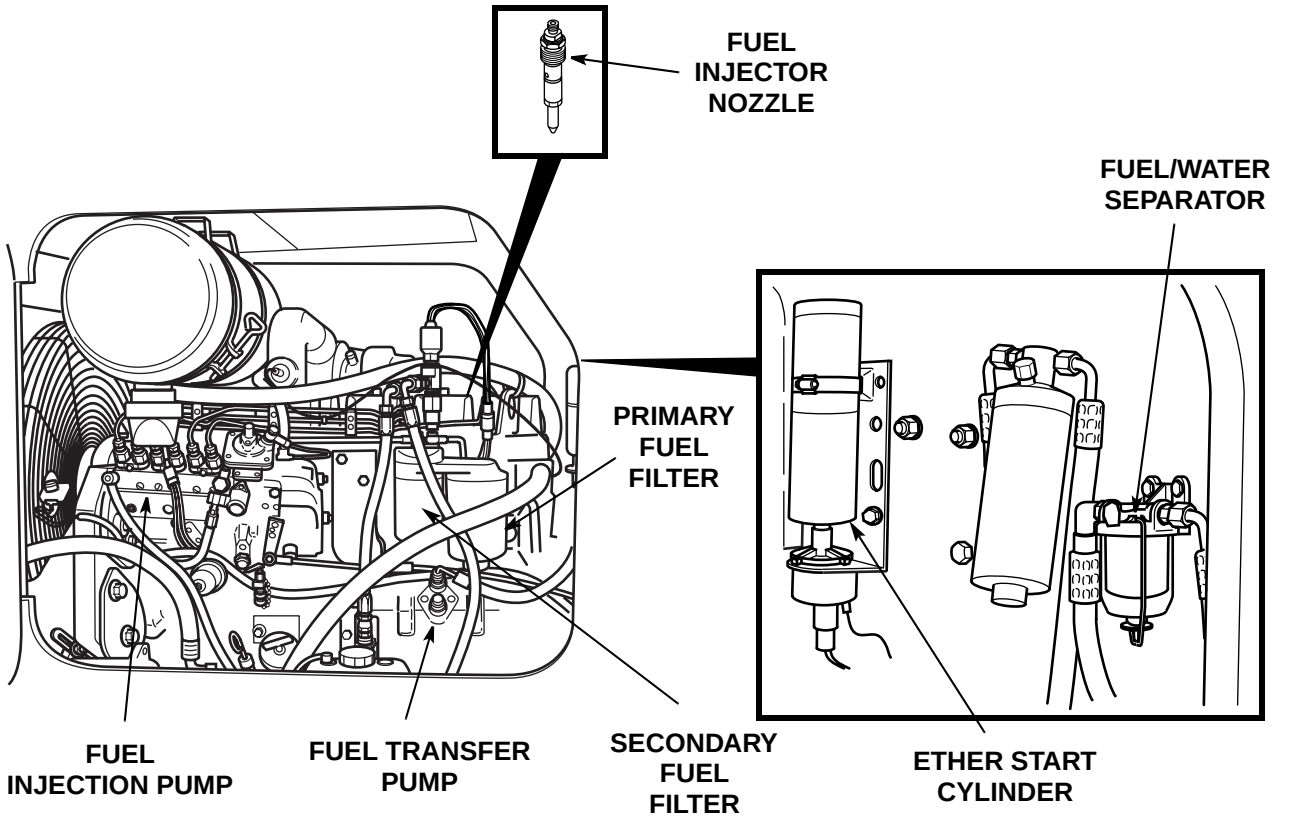
Max lift height with 6K carriage:	
6,000 lb (max height)	27 ft, 11.5 in.
Max lift height with 10K carriage:	
6,000 lb (max height)	27 ft, 8 in.
8,000 lb	24 ft, 9.5 in.
10,000 lb	16 ft, 11 in.
Boom Lift Angle (Maximum)	45 degrees
Max reach from load center to front tires with 6K carriage, (4,000 lb @ 2 ft load center)	24 ft, 3.5 in.
Max reach from load center to front tires with 10K carriage, (2,000 lb @ 4 ft load center)	26 ft, 4 in.
Max reach below grade with 6K carriage	33.3 in.
Max reach below grade with 10K carriage	36.8 in.
Ground Clearance	15.2 in. min
Curb to Curb Turning Circle (Diameter)	27 ft, 10 in.
Frame Oscillation	9 degrees to the left or right
Fording Depth (Freshwater)	3 ft
Travel Speed (Maximum)	23 mph

Section III. TECHNICAL PRINCIPLES OF OPERATION

1-11. GENERAL

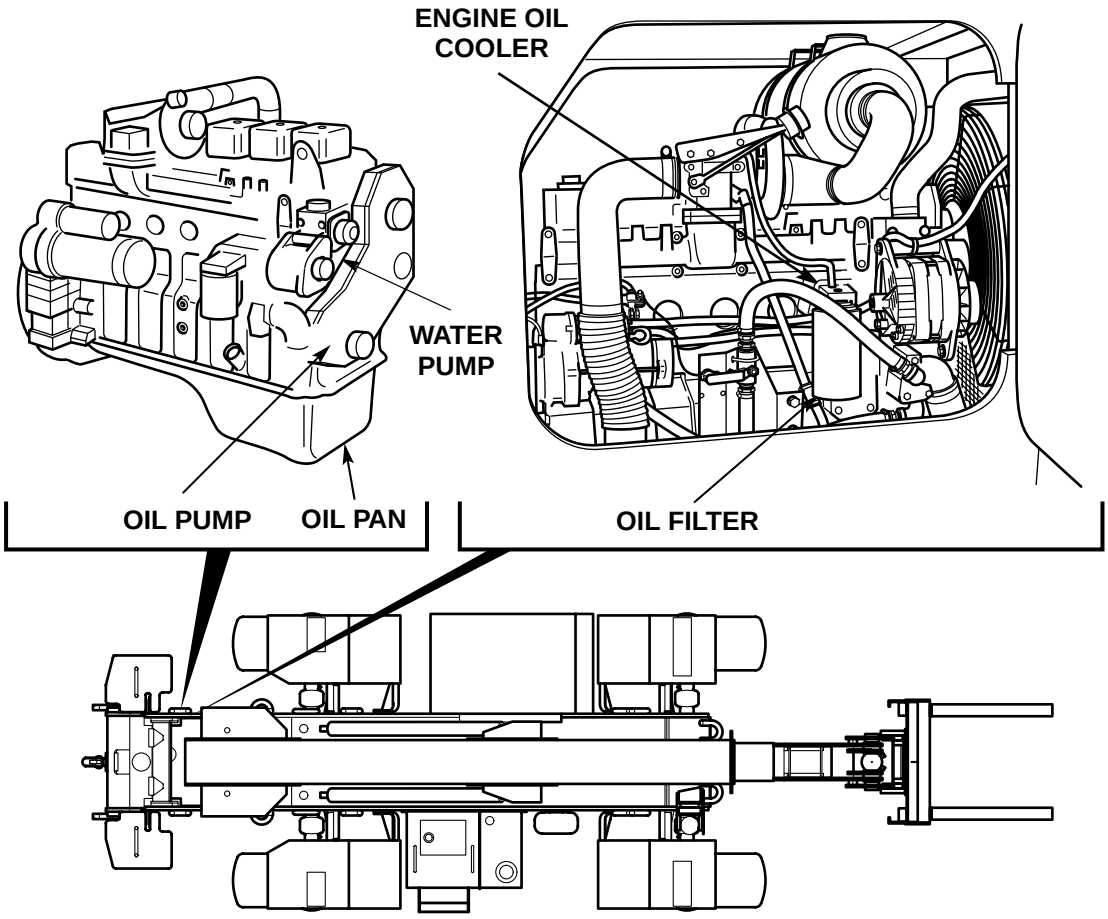
This section explains how components of the ATLAS work together. A functional description is given for the fuel system, engine lubrication system, engine cooling system, steering and brake system, electrical system, and hydraulic system.

1-12. FUEL SYSTEM

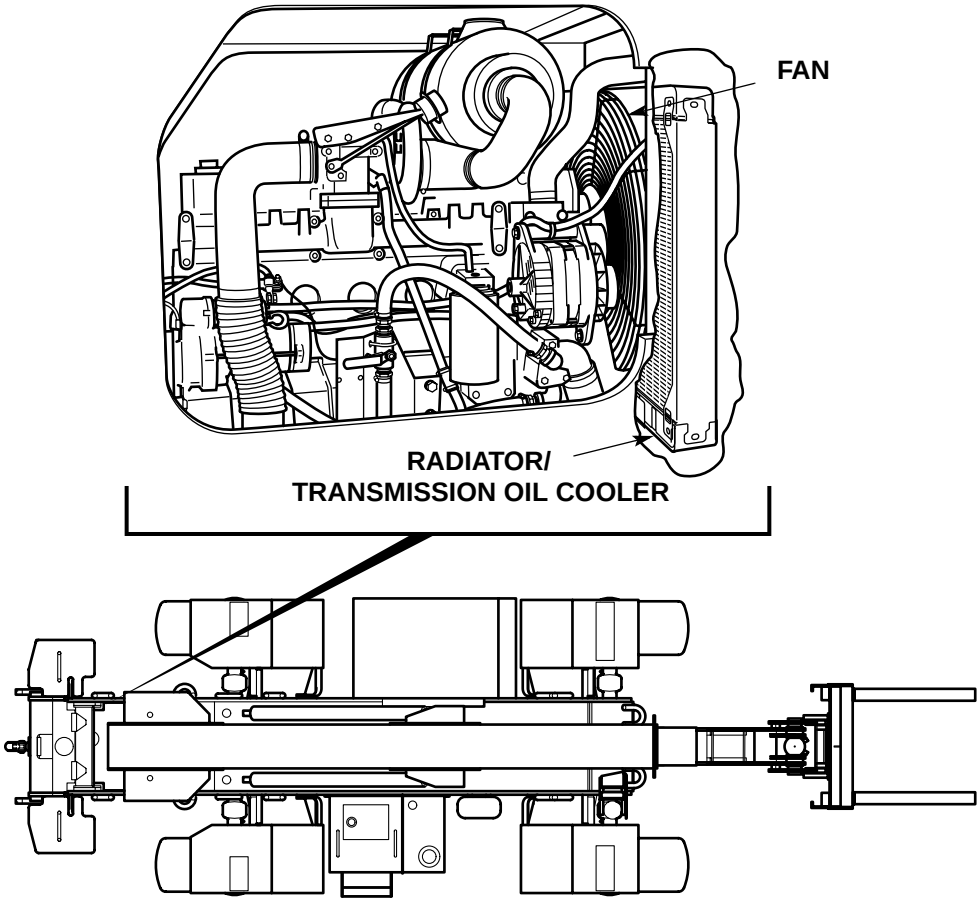


Item	Description
Fuel/Water Separator	Removes moisture from fuel.
Primary and Secondary Fuel Filters	Removes larger particles from the fuel before it reaches the injector pump.
Fuel Transfer Pump	Pulls fuel from the fuel tank through the water separator and sends it through the fuel filters to the fuel injection pump.
Fuel Injection Pump	Sends exact amount of fuel to the injector nozzles.
Fuel Injector Nozzle	Turns the stream of fuel into a fine spray which permits good combustion in the cylinder. There is one nozzle for each cylinder.
Ether Start Cylinder	Contains ether starting fluid for starting cold engine. Starting fluid is released in measured amounts by pressing the engine primer button.

1-13. ENGINE LUBRICATION AND COOLING SYSTEMS

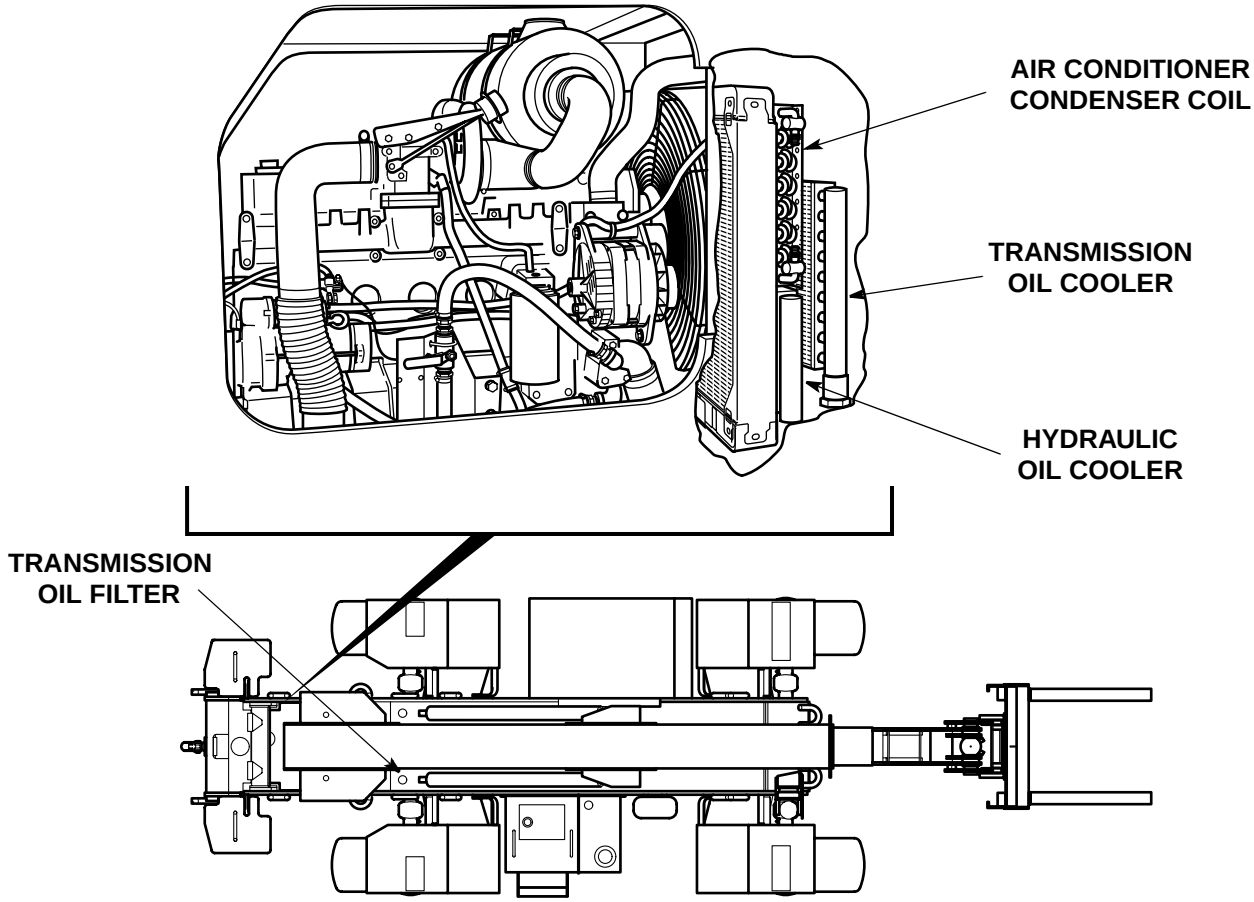


Item	Description
Oil Pump	Draws oil from the oil pan, sends it through the oil cooler and then through the oil filter. From the filter, the oil enters the cylinder block to lubricate the engine and is then returned to the oil pan. From the filter, oil is also sent through the turbocharger and then returned to the oil pan.
Oil Pan	Contains the oil that lubricates moving parts in the engine.
Engine Oil Cooler	Engine oil flows through the plates of the oil cooler. As the oil warms, heat is transferred to the coolant which flows from the radiator. The coolant flows across the plates of the oil cooler.
Oil Filter	Removes particles from the oil which could cause damage to the internal parts of the engine.
Water Pump	Draws coolant from the radiator and sends it through the oil cooler cavity and cylinder block to cool the engine. The coolant then returns to the radiator.



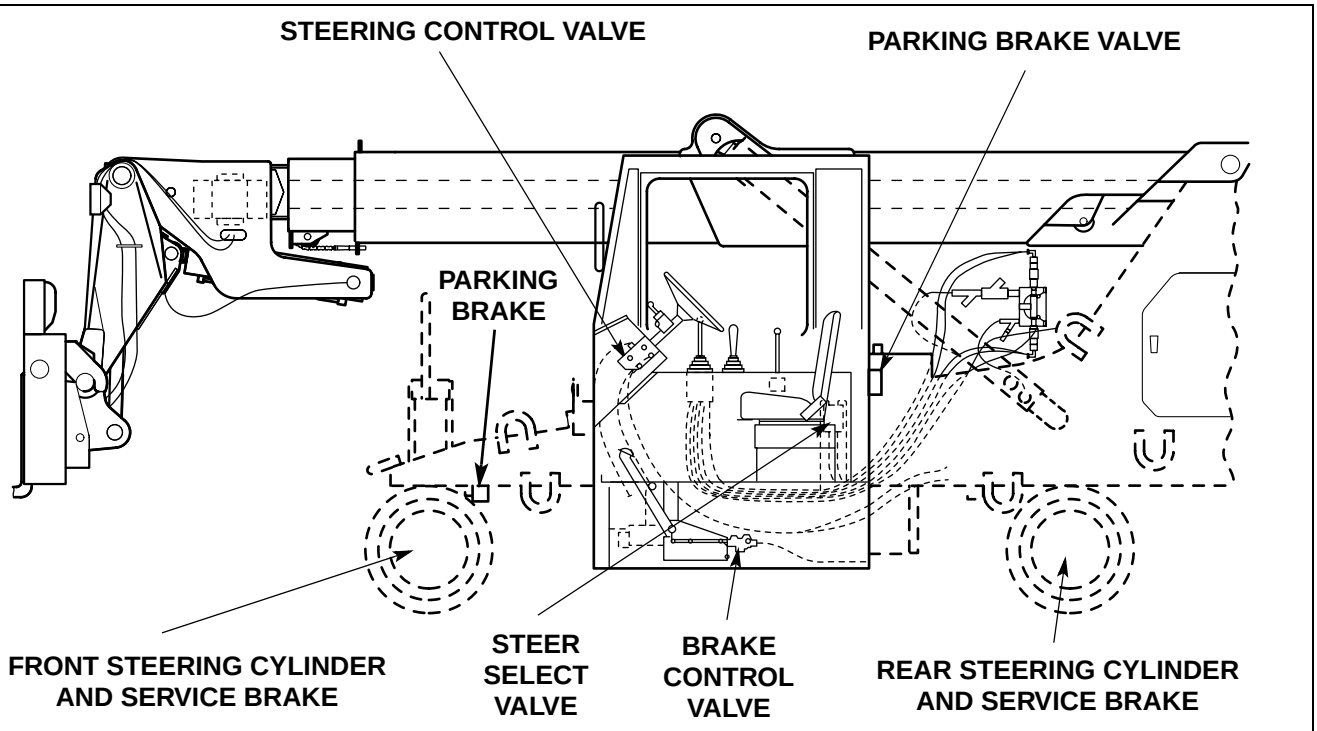
Item	Description
Fan	Turned by the engine drive belt, the fan creates air flow through the radiator to lower the temperature of the coolant as it passes through the radiator.
Radiator	ATLAS uses an overflow cooling system. The system is full when two quarts of coolant are visible in the overflow bottle. Coolant circulates through the radiator to be cooled after leaving the cylinder block.

1-14. TRANSMISSION LUBRICATION AND COOLING SYSTEMS



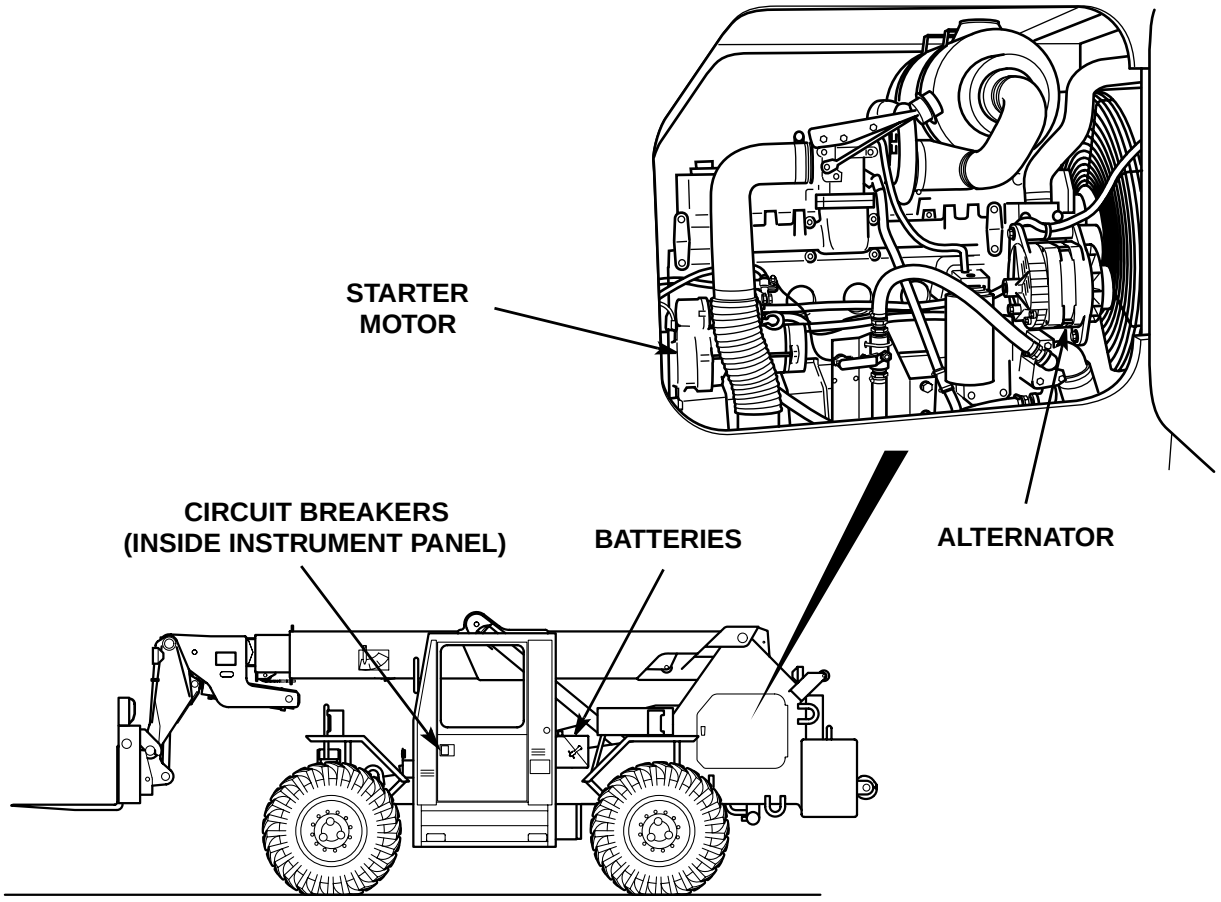
Item	Description
Transmission Oil Filter	Located on vehicle right side, just above the boom hoist cylinder on the engine bulkhead. Removes particles in the oil which could damage internal components of the transmission. A pump inside the transmission produces oil flow through the filter, transmission, and oil cooler.
Transmission Oil Cooler	Located to the front of the radiator and to the front of the hydraulic oil cooler. Transmission fluid is circulated across the cooler to lower transmission oil temperature.
Hydraulic Oil Cooler	Located between the radiator and the transmission oil cooler and below the air conditioning cooler. Hydraulic fluid is circulated across the cooler to lower the hydraulic fluid temperature.
Air Conditioner Condenser Coil	Located to the front of the radiator and above the hydraulic oil cooler. Circulates vaporized refrigerant changing from a vapor to a liquid to provide cool air inside the cab.

1-15. STEERING AND BRAKE SYSTEM



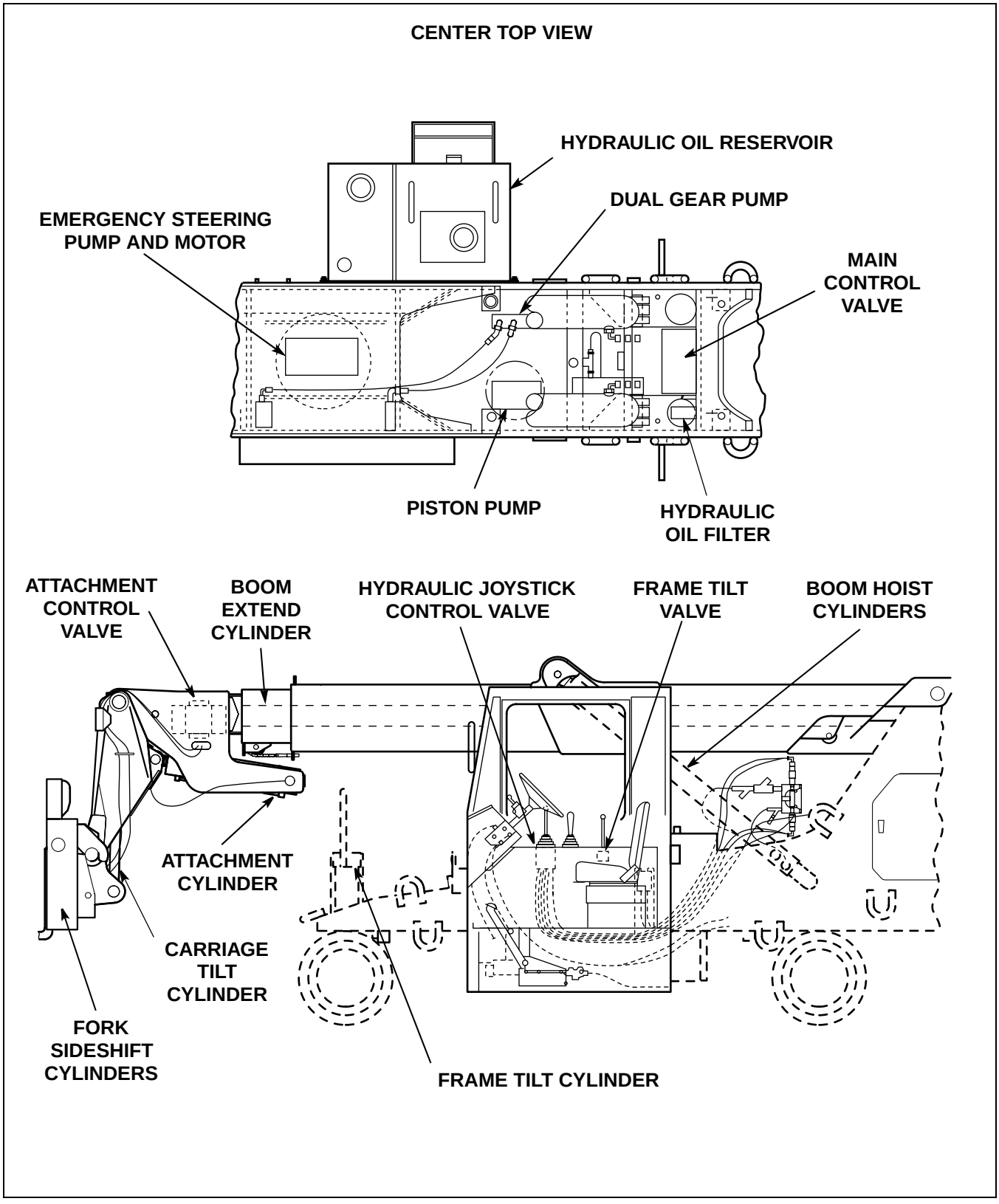
Item	Description
Steering Cylinders	A steering cylinder is mounted at both ends of each axle and controlled by the steering wheel.
Steering Control Valve	Connected directly to the steering wheel and located behind the instrument access panel. Controls the steering function by directing the flow of hydraulic fluid to the cylinders.
Steer Select Valve	Mounted in the frame. Allows the selection of two wheel, four wheel, or crab steering through the steer select control, a three position switch.
Brake Control Valve	Located under the cab. Provides a priority flow to the brake system, including the parking brake. Excess flow is directed by the priority valve to the frame tilt system.
Service Brakes	Dry disc, caliper type brakes are mounted on all four wheels. Brakes are hydraulically actuated by pressing the brake pedal. An accumulator in the braking system enables a limited number of stops without engine power.
Parking Brake	A spring applied and hydraulically released dry disc brake mounted on the input shaft at the front axle. A switch in the cab engages and disengages the parking brake.
Parking Brake Valve	Mounted on frame cross piece. Controls application/release of hydraulic fluid pressure to the parking brake.

1-16. ELECTRICAL SYSTEM



Item	Description
Batteries	Provide power for the electrical circuits. Two 12 volt batteries are connected in series to provide starting power.
Alternator	The 24 volt, 70 amp alternator, an integral part of the charging circuit, provides current to charge the batteries when the engine is running.
Starter Motor	Part of the starting circuit, the starter motor is used to turn the engine flywheel fast enough to start the engine.
Circuit Breakers	Located inside instrument panel. Switches that open the battery circuit if there is a shorted, grounded wire or excessive current draw by a defective component in the corresponding circuit. When the circuit is open, no current will flow through the electrical system. Circuit breakers will automatically reset once they cool. If a breaker continually trips, the electrical system requires repair.

1-17. HYDRAULIC SYSTEM



Item	Description
Hydraulic Oil Reservoir	Contains oil for the entire hydraulic system.
Hydraulic Oil Filter	Removes smaller harmful particles from the oil before the oil returns to the reservoir.
Main Control Valve	Located on the engine compartment bulkhead of the main frame (near back of transmission). Operated by the hydraulic joystick to control: boom hoist/lower and extend/retract.
Attachment Control Valve	Mounted on the boom point and controlled by an electrical joystick. Controls the three attachment functions: hoist/lowering, carriage tilt, and fork sideshift.
Frame Tilt Valve	Mounted inside the console located to the right of the operator's seat. Controls the tilting of the vehicle frame. Operated by frame tilt control lever.
Hydraulic Joystick Control Valve	Located on the side console in cab. Controls the following boom functions: raise, lower, extend, and retract.
Dual Gear Pump	Mounted to and driven by the transmission to supply hydraulic oil flow. This two section pump supplies hydraulic fluid for the following functions: boom hoist, boom extend, steering, brakes, and frame tilt.
Piston Pump	Mounted to and driven by the transmission. This pump supplies hydraulic fluid for the following functions: attachment hoist, carriage tilt, and fork sideshift control.
Emergency Steering Pump and Motor	Located in the vehicle frame forward of the transmission. Supplies 5 gpm of emergency flow to the steering system whenever the starter-run control switch is on and there is a loss of hydraulic oil pressure. The pump is driven by an electric motor.
Fork Sideshift Cylinders	Two cylinders controlled by the electric joystick. Both cylinders can be operated at the same time to sideshift forks left or right or move forks together or apart. Cylinders can also be operated individually.
Carriage Tilt Cylinder	Operated by the electric joystick. Moving the lever to the right causes the cylinder to retract and the fork tips to lower. Moving the lever to the left causes cylinder to extend and the fork tips to raise.
Attachment Cylinder	This cylinder is controlled by the electric joystick. When the lever is pushed forward, the cylinder will retract. When the lever is pulled back, the cylinder will extend and raise the attachment.
Boom Extend Cylinder	This cylinder is controlled by the hydraulic joystick. Moving the lever to the right extends the cylinder. Moving the lever to the left retracts the cylinder.
Frame Tilt Cylinder	This cylinder is controlled by the frame tilt control joystick. When the lever is moved forward, the vehicle tilts to the left. Moving the lever back tilts the vehicle to the right.
Boom Hoist Cylinders	Two cylinders controlled by the boom hoist control joystick. When the lever is moved forward, the boom lowers. Moving the lever backward causes the boom to raise.

CHAPTER 2
OPERATING INSTRUCTIONS

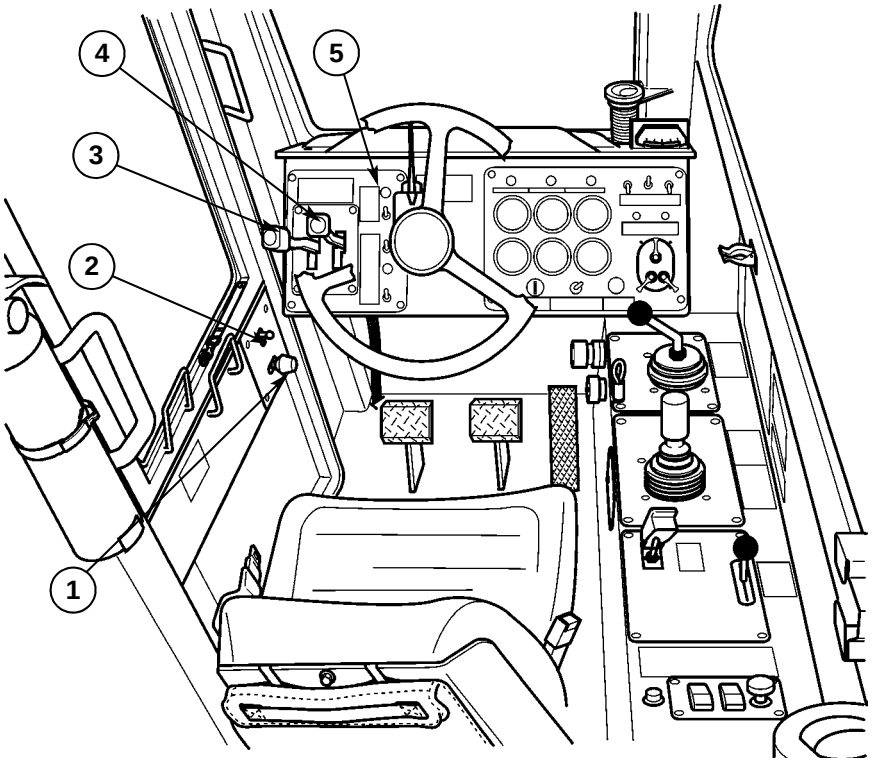
Para	Contents	Page
	Section I. Description and Use of Operator's Controls and Indicators	
2-1.	Operator's Controls and Indicators	2-1
	Section II. Preventive Maintenance	
2-2.	General	2-16
2-3.	PMCS Procedures	2-16
2-4.	Lubrication Instructions	2-18
	Section III. Operation Procedures	
2-5.	General	2-31
2-6.	New Vehicle Break-in	2-31
2-7.	Starting the Engine	2-32
2-8.	Moving the Forklift	2-36
2-9.	Steering the Forklift	2-42
2-10.	Stopping the Forklift	2-44
2-11.	Stopping the Engine	2-44
2-12.	6K/10K Fork Carriage Removal/Installation	2-45
2-13.	Roading the 6K Fork Carriage	2-47
2-14.	Counterweights Removal/Installation	2-48
2-15.	Highway Transport	2-53
2-16.	Rail Transport	2-55
2-17.	Loading and Unloading Ammunition and Other Pallets from a Container or Trailer	2-57
2-18.	Rifle Mount	2-59
2-19.	Decontamination Unit	2-60
2-20.	Decals and Warning Plates	2-61
	Section IV. Operation Under Unusual Conditions	
2-21.	General	2-63
2-22.	Operation in Extreme Moist Heat	2-63
2-23.	Operation in Extreme Dry Heat (Refer to FM 90-3, DESERT OPERATIONS)	2-63
2-24.	Operation in Extreme Cold (To –25° F)	2-64
2-25.	Operation with Arctic Kit (To –40° F)	2-67
2-26.	Operation in Salt Water Areas	2-74
2-27.	Operation in Dust or Sandstorms	2-74
2-28.	Fording	2-74
2-29.	Slave Starting	2-76
2-30.	Towing Other Vehicles	2-77
2-31.	Towing the ATLAS	2-78
2-32.	Emergency Boom Operations	2-81
2-33.	Rear Window Emergency Exit	2-88

Section I. DESCRIPTION AND USE OF OPERATOR'S CONTROLS AND INDICATORS

2-1. OPERATOR'S CONTROLS AND INDICATORS

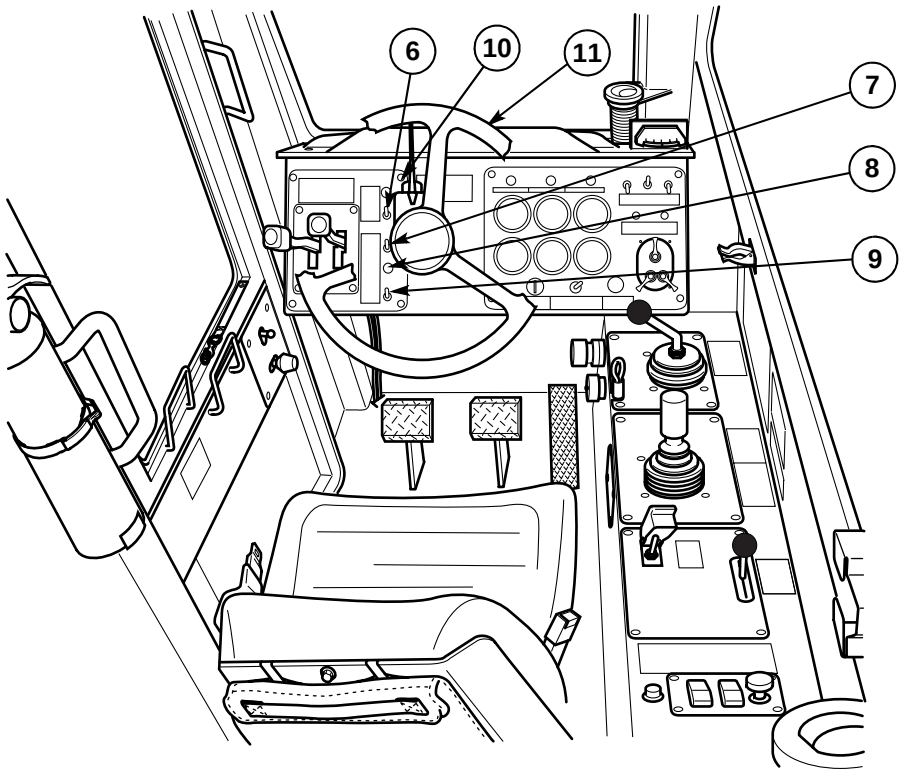
This section describes, locates, and illustrates the controls and indicators used on the ATLAS.

Table 2-1. Cab Door and Instrument Panel Controls



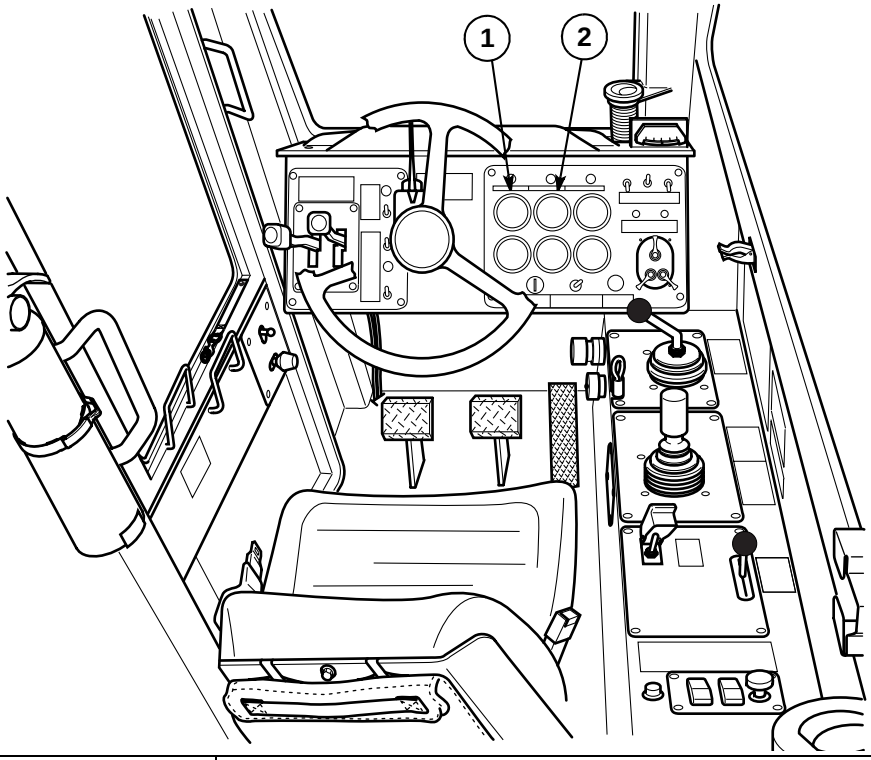
Key	Control/Indicator	Function
1	Lower Cab Door Release	Opens the upper and lower cab door. Pull back horizontally on the knob to open the door.
2	Upper Cab Door Release	Opens the upper cab door. Pull down on the knob to release the upper cab door. A latch on the door that hooks on the fender will hold the door in a full open position.
3	Travel Select Control	Controls vehicle direction of travel. Move the lever all the way up to travel forward. Move the lever to the center position for neutral. Move the lever all the way down to travel in reverse.
4	Range Select Control	Controls vehicle travel speed. Move the lever all the way up to position 3 for high ground speed. Move the lever to center position 2 for normal speed conditions. Move the lever all the way down to position 1 for highest torque and pulling power.
	WARNING Do not travel with t4he automatic fork level switch in the ON position. It is possible to drop a load which could result in load damage, or injury or death to personnel.	
5	Automatic Fork Level Indicator Light	Illuminated whenever the automatic fork level switch is in the ON position.

Table 2-1. Cab Door and Instrument Panel Controls - CONT.



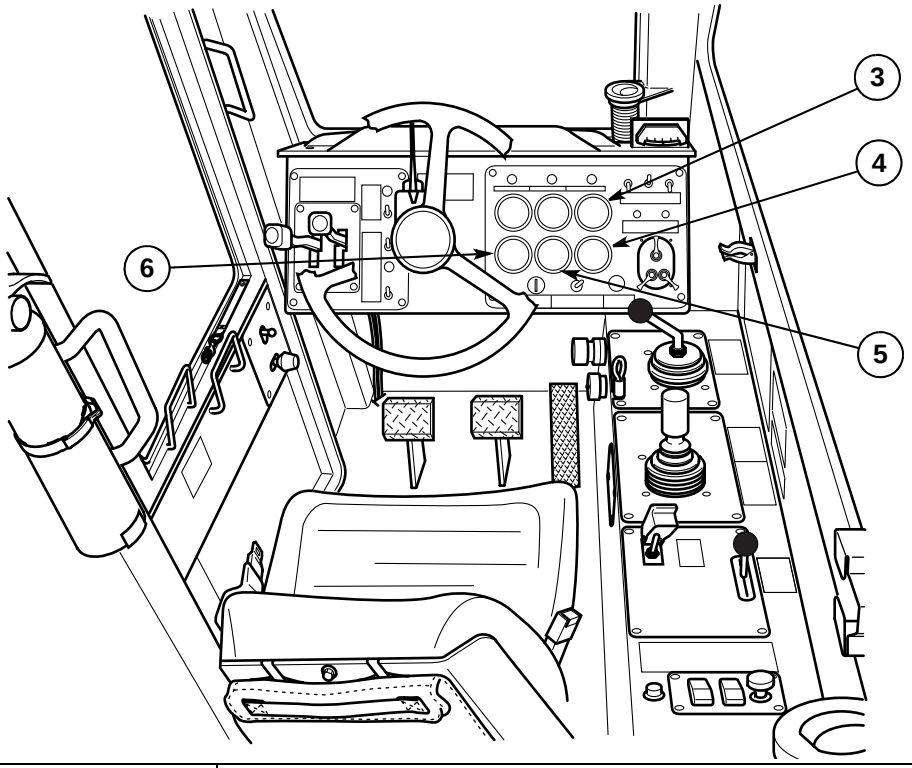
Key	Control/Indicator	Function
6	Automatic Fork Level Switch	Automatically controls the level of the forks when in the ON position. In the OFF position, forks can be tilted manually with the electric joystick control.
		CAUTION The windshield wipers should not be operated on dry windows for extended periods of time.
7	Front Window Wiper Switch	A three position switch which controls the front windshield wiper. Move the switch up for high speed operation, to the middle for OFF, and down for low speed operation.
8	Window Wash Button	Sprays washer fluid onto the front and rear windows. Push the button and use the wipers to wash the front and rear windows.
9	Rear Window Wiper Switch	A three position switch which controls the rear windshield wiper. Move the switch up for high speed operation, to the middle for OFF, and down for low speed operation.
10	Directional Light Switch	Operates with the ignition key on or off. Move the directional lever right or left to operate turn signal lights. Pull the tab out to operate four-way hazard flasher. Move the directional lever right or left to disengage hazard flashers.
11	Steering Wheel	Controls vehicle direction of travel. Turn steering wheel clockwise to turn right, counterclockwise to turn left.

Table 2-2. Instrument Panel Gages



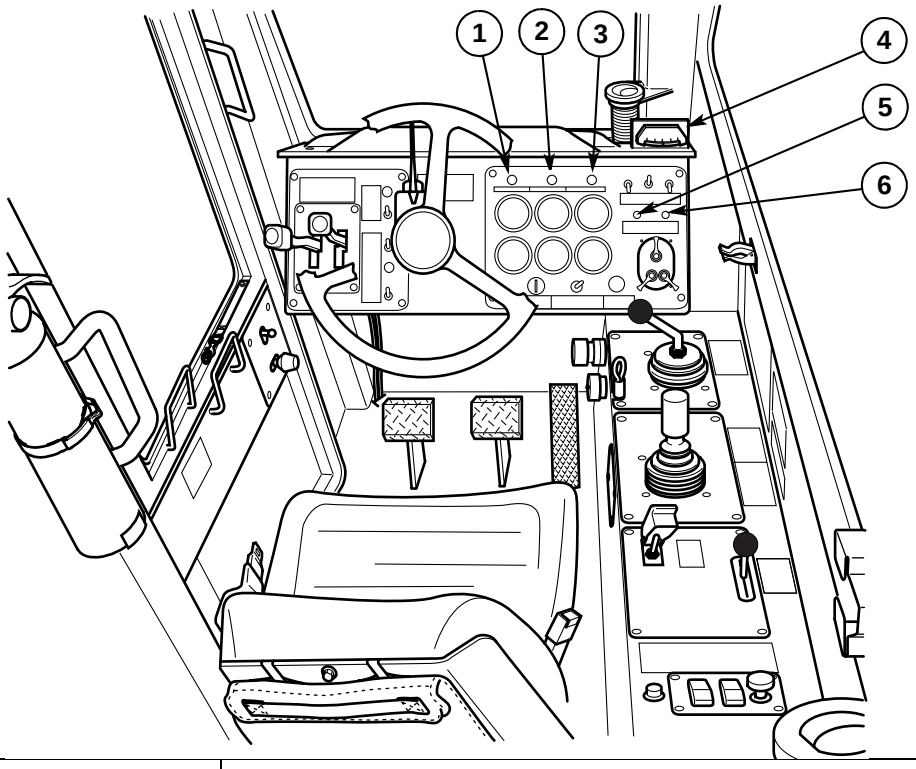
Key	Control/Indicator	Function
		CAUTION If coolant temperature exceeds 220° F or the warning light illuminates, shut the engine down immediately. Do not operate the vehicle continuously at a coolant temperature above 210° F, or damage to the equipment could result.
1	Water Temperature Gage	Indicates temperature of the engine water/coolant mixture. Normal operating temperature of water/coolant is between 180° F and 210° F.
		CAUTION If engine oil pressure fluctuates, drops, or if the warning light is illuminated, stop the engine and find the cause. Do not operate the engine at oil pressures lower than 10 psi, or damage to the equipment could result.
2	Engine Oil Pressure Gage	Indicates the pressure at which engine internal lubricating oil is being maintained. Normal oil pressure at operating temperature is between 30 psi and 90 psi.

Table 2-2. Instrument Panel Gages - CONT.



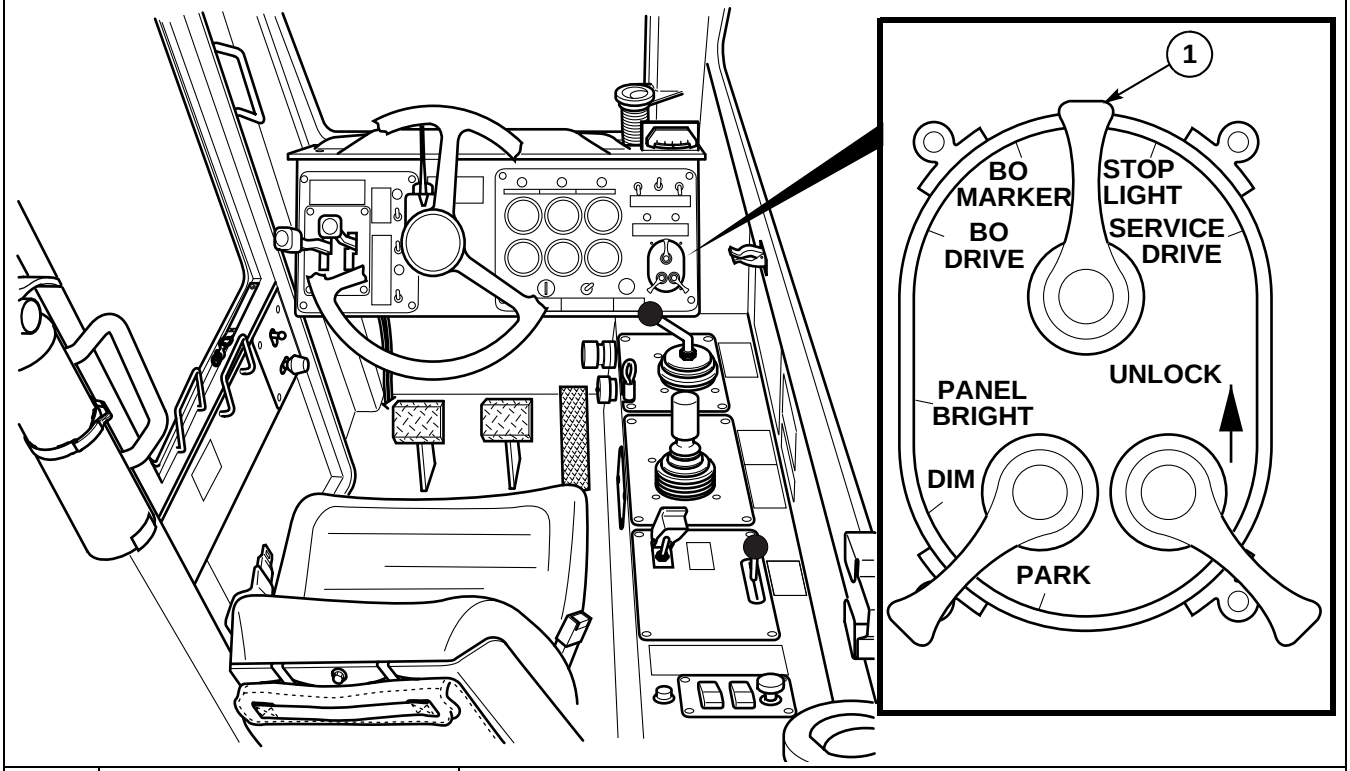
Key	Control/Indicator	Function
		CAUTION If transmission oil temperature reaches 250° F or the warning light illuminates, move the transmission range select lever to NEUTRAL and run the engine at low idle (between 1,000 and 1,200 rpm). Within two or three minutes, the temperature should drop to normal values. If not, stop the vehicle and correct the problem before continuing, or damage to the equipment could result.
3	Transmission Oil Temperature Gage	Indicates temperature of the transmission lubricating oil. Transmission oil temperature must not exceed 250° F.
4	Fuel Gage	Indicates how much fuel remains in the fuel tank.
5	Voltmeter	Indicates electrical system voltage. Normal operating voltage is between 24 and 28.5 volts.
6	Hourmeter	Records the hours of vehicle operation. Used to schedule periodic maintenance procedures.

Table 2-3. Dash Lights and Indicators



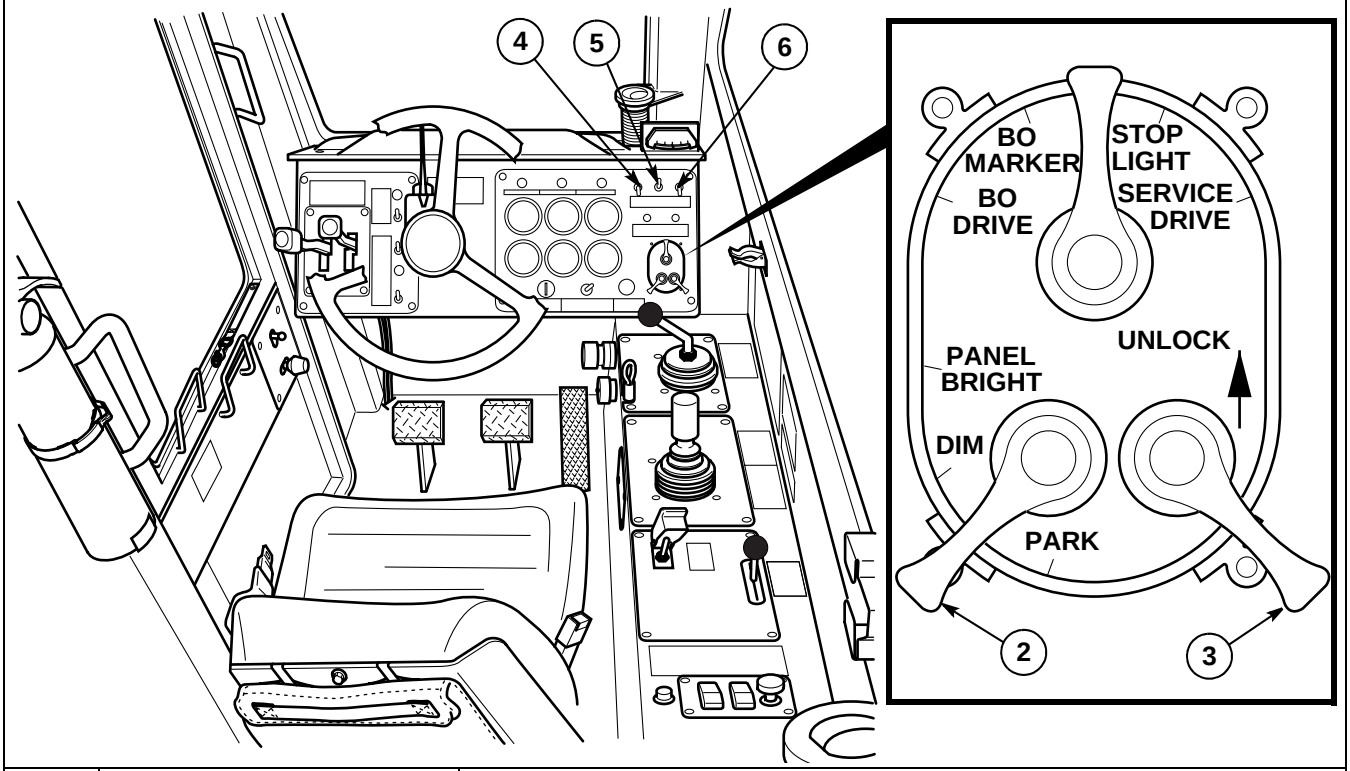
Key	Control/Indicator	Function
	NOTE To test a bulb and circuit, turn the starter-run control keyswitch to ON and press the lens in. If the light does not illuminate, then either a new bulb is required or the circuit is not functioning properly.	
1	High Water Temperature (Engine) Warning Light	Indicates excessively high engine coolant temperature. Illuminated whenever coolant temperature exceeds 220° F.
2	Low Oil Pressure (Engine) Warning Light	Indicates excessively low engine oil pressure. Illuminated whenever oil pressure drops below 10 psi.
3	High Transmission Temperature Warning Light	Indicates excessively high transmission oil temperature. Illuminated whenever transmission oil temperature exceeds 250° F.
4	Lateral Level Indicator	Indicates the angle of the frame relative to the horizon. Assists in maintaining a level attitude on sideslope up to 9 degrees (15%).
5	Parking Brake Indicator Light	Illuminated when the starter-run control switch is ON and the parking brake is engaged.
	WARNING Shut vehicle down immediately whenever the low brake pressure warning light is illuminated. Failure to comply could result in injury or death to personnel.	
6	Low Brake Pressure Warning Light	Indicates service brake low pressure. Illuminated whenever hydraulic pressure in the accumulator drops below 650 psi.

Table 2-4. Lighting Switches



Key	Control/Indicator	Function
1	Service Lighting Control Switch	This switch has five positions. The following shows the lights that operate in each position: OFF Position – Only the turn signals, four-way flashers, and the forward, rear, and boom floodlights will illuminate. BLACKOUT MARKER Position – Blackout front markers, blackout tail lights, and blackout stop lights will illuminate. BLACKOUT DRIVE Position – Blackout front markers, blackout tail lights (with brake pedal depressed), blackout stop lights, and blackout drive lights will illuminate. Back-up alarm will not operate. STOP LIGHT Position – Service stop lights (with brake pedal depressed) will illuminate. SERVICE DRIVE Position – Service stop lights (with brake pedal depressed), service tail lights, and service headlamps will illuminate.

Table 2-4. Lighting Switches - CONT.



Key	Control/Indicator	Function
2	Auxiliary Lighting Switch	This switch has four positions. The following shows the lights that operate in each position: OFF Position – Instrument panel lights and parking lights will not illuminate. PARK Position – Parking lights will illuminate if service light switch is in SERVICE DRIVE position. PANEL DIM Position – Instrument panel lights are on with minimum illumination. PANEL BRIGHT Position – Instrument panel lights are on with maximum illumination.
3	Switch Lock	This lock is used to prevent accidental movement of the main lighting control switch. Lift lock lever to move service lighting control switch to STOP LIGHT, SERVICE DRIVE and BO DRIVE positions.
4	Light Switch (Forward Floods)	Controls the forward floodlights.
5	Light Switch (Boom Flood)	Controls the boom floodlight.
6	Light Switch (Rear Floods)	Controls the rear floodlights.

Table 2-5. Boom, Attachment, Frame Tilt and Fork Controls

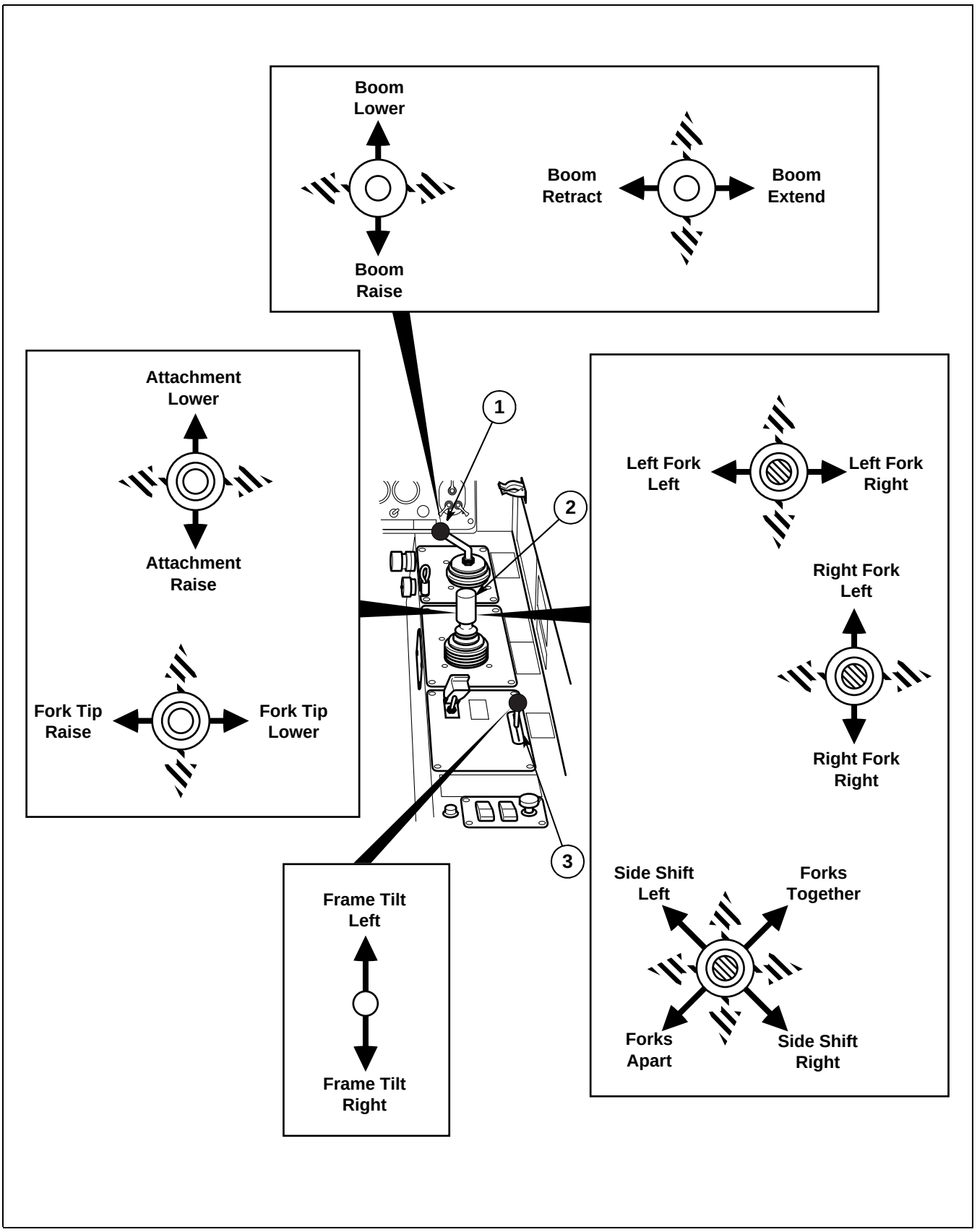
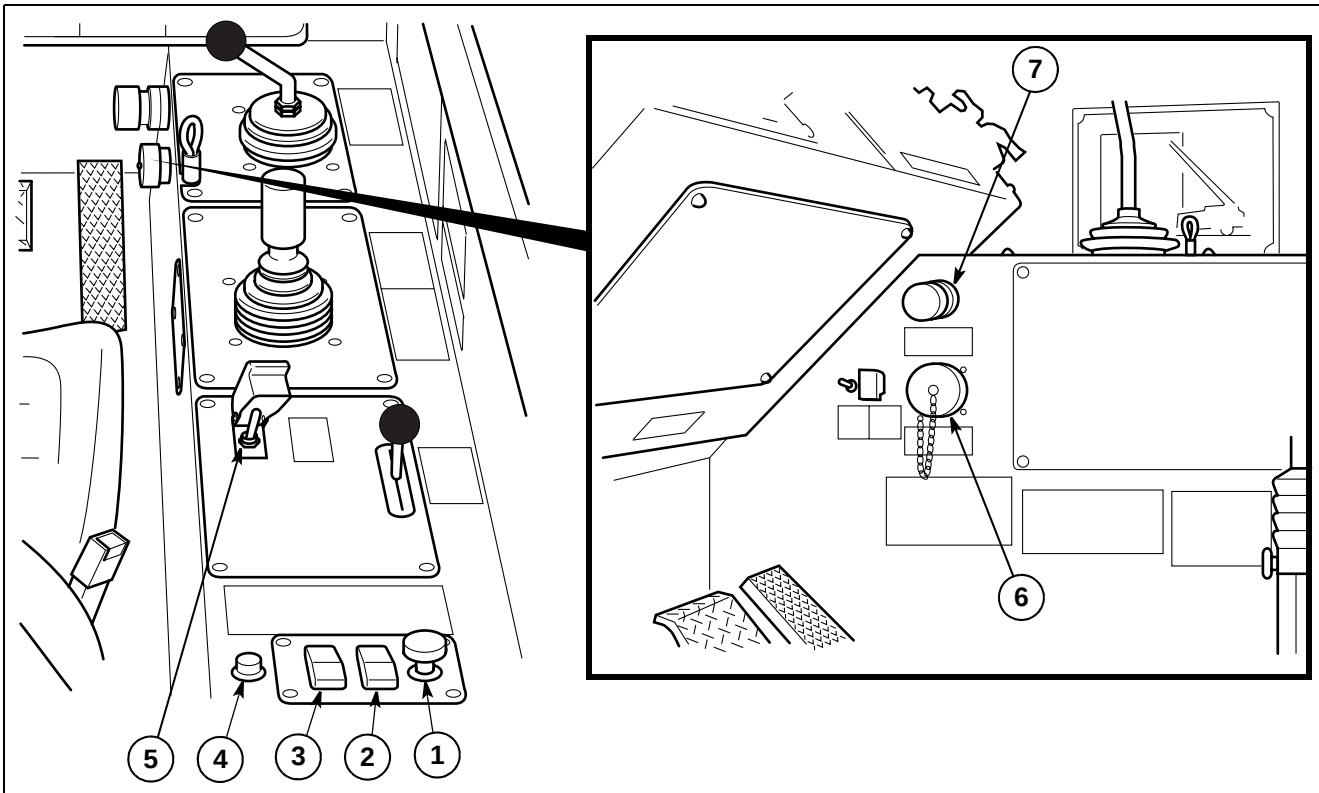


Table 2-5. Boom, Attachment, Frame Tilt and Fork Controls - CONT.

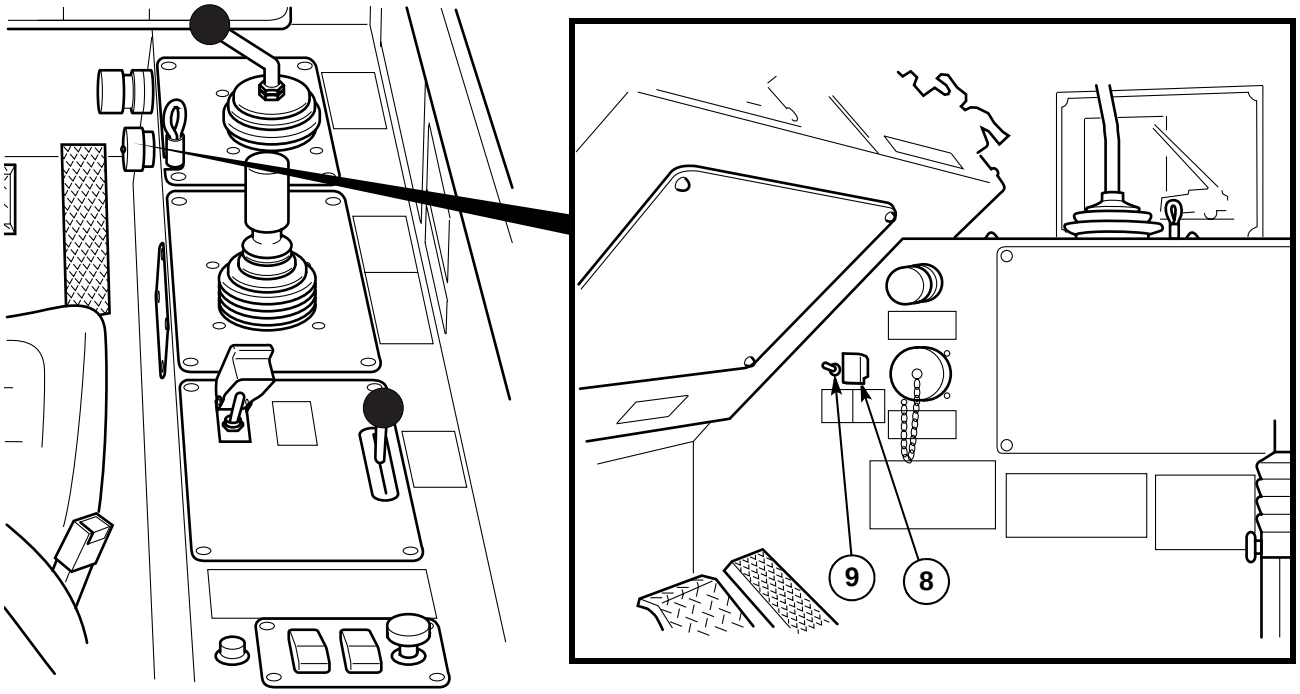
Key	Control/Indicator	Function
		WARNING Do not raise or extend the boom unless the frame is level. Failure to comply could cause the load to drop or machine to tip, resulting in injury or death to personnel.
1	Hydraulic Joystick Control	Controls the movement of the boom: raising, lowering, extending, and retracting. Push the joystick forward to lower the boom. Pull the joystick back to raise the boom. Move the joystick to the left to retract the boom. Move the joystick to the right to extend the boom.
2	Electric Joystick Control	Controls the movement of the attachment and forks: attachment raise and lower, forks sideshift and carriage tilt. Push the joystick forward to lower the attachment. Pull the joystick back to raise the attachment. Move the joystick to the right to lower the fork tips. Move the joystick to the left to raise the forks tips. The carriage tilt will operate only when the automatic fork level switch is in the OFF position.
		CAUTION Hold the button until the joystick is returned to the center position. If button is not held, the resulting hydraulic pressure spike could damage the equipment.
		Push the button on top of the joystick down and hold. Move the joystick to the left to shift the left fork to the left. Move the joystick to the right to shift the left fork to the right. Push the button down and hold. Pull the joystick back to shift the right fork to the right. Push the joystick forward to shift the right fork to the left. To sideshift both left and right forks to the right, push the button down and pull the joystick to the right rear corner. Push the button down and push the joystick to the left front corner to sideshift left. To move the forks apart, push the button down and pull the joystick to the left rear corner. Push the button down and push joystick to right front to move the forks together.
3	Frame Tilt Control	Controls tilt of the frame. Push the lever forward to tilt vehicle left. Pull the lever back to tilt vehicle right.

Table 2-6. Side Console Switches and Controls



Key	Control/Indicator	Function
1	Heater Temperature Control	Controls the inside cab temperature. Push to decrease temperature. Pull to increase temperature.
2	Heater/Air Conditioner Selector Switch	A three-position rocker switch controls the use of the heater/air conditioner. Heater/air conditioner is OFF in the center position. Move switch forward for air conditioning (white light illuminates) and backward for heater (red light illuminates).
3	Heater/Air Conditioner Blower Switch	A three-position rocker switch controls the air flow of the heater/air conditioner. Blower is OFF in the center position. Move switch forward for high (two blowers operating) and backward for low (one blower operating).
4	Engine Primer Button	Aid for cold weather starting. Push the button to inject a measured amount of ether into the engine's intake manifold.
5	Parking Brake Switch	A toggle switch that applies/releases the parking brake.
6	STE/ICE Diagnostic Connector	Connection point for the STE/ICE test equipment.
7	Instrument Resistor Module	ldentifies the vehicle to the STE/ICE Test equipment.

Table 2-6. Side Console Switches and Controls - CONT.

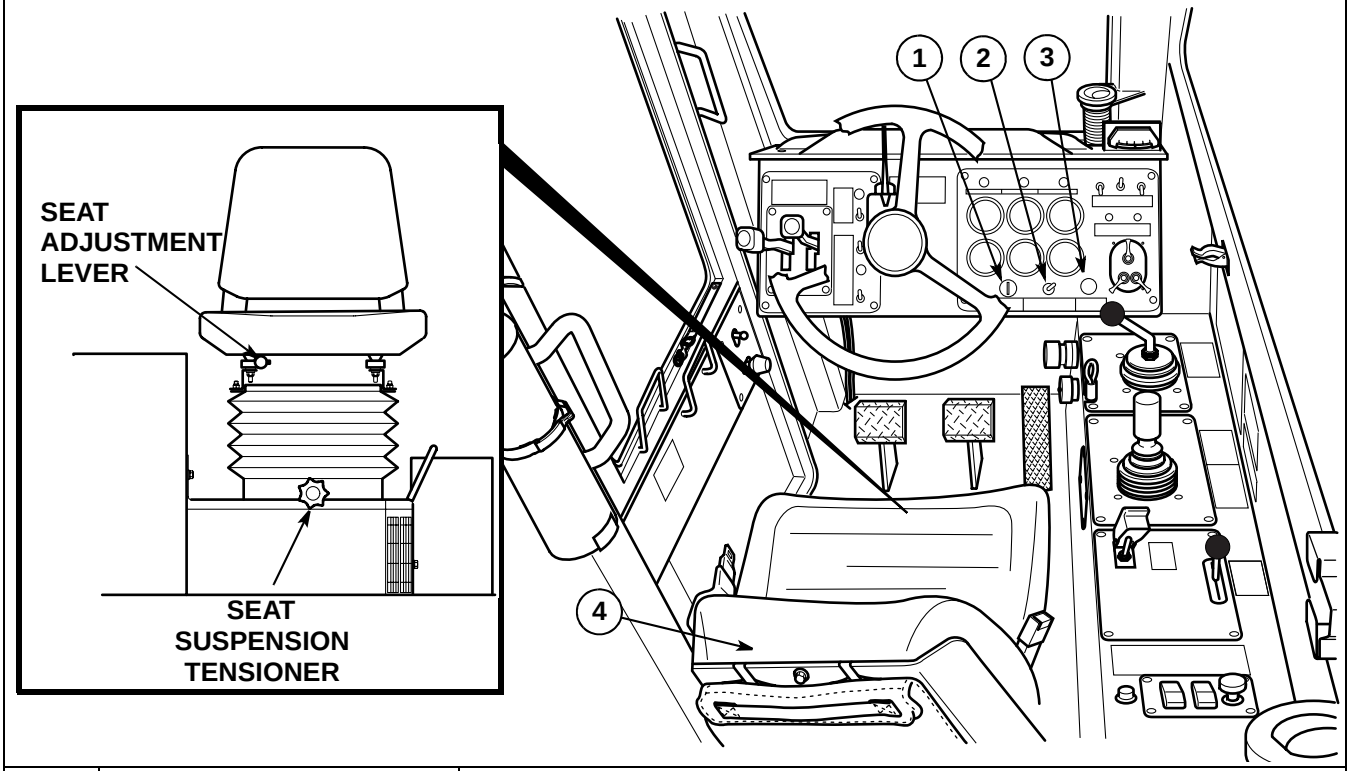


WARNING

Make sure the Emergency Steer Switch is returned to the ON position when STE/ICE testing is completed. If engine power is lost, there will also be a loss of emergency steering capability. Failure to follow this precaution could result in injury or death to personnel.

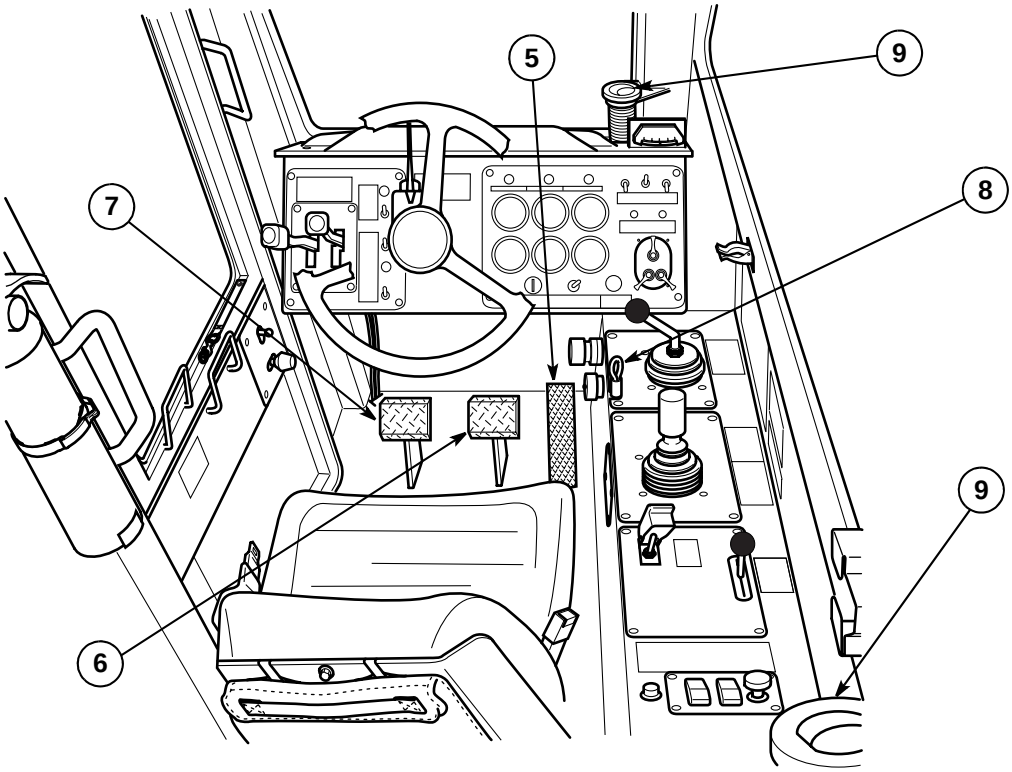
8	Emergency Steer Switch	Turns the steering pump circuit off during maintenance activities when it is not necessary to operate and for cold weather starting. The switch is ON when the red cover is down and the switch down. The switch is OFF when the red cover is up and the switch up.
9	Auxiliary Fuel Shut-Off Switch	Permits cranking the engine without starting during Simplified Test Equipment for Internal Combustion Engines (STE/ICE) diagnostic testing. The switch is OFF when up. The switch is ON when down.

Table 2-7. Miscellaneous Controls Operator Seat and Foot Pedals



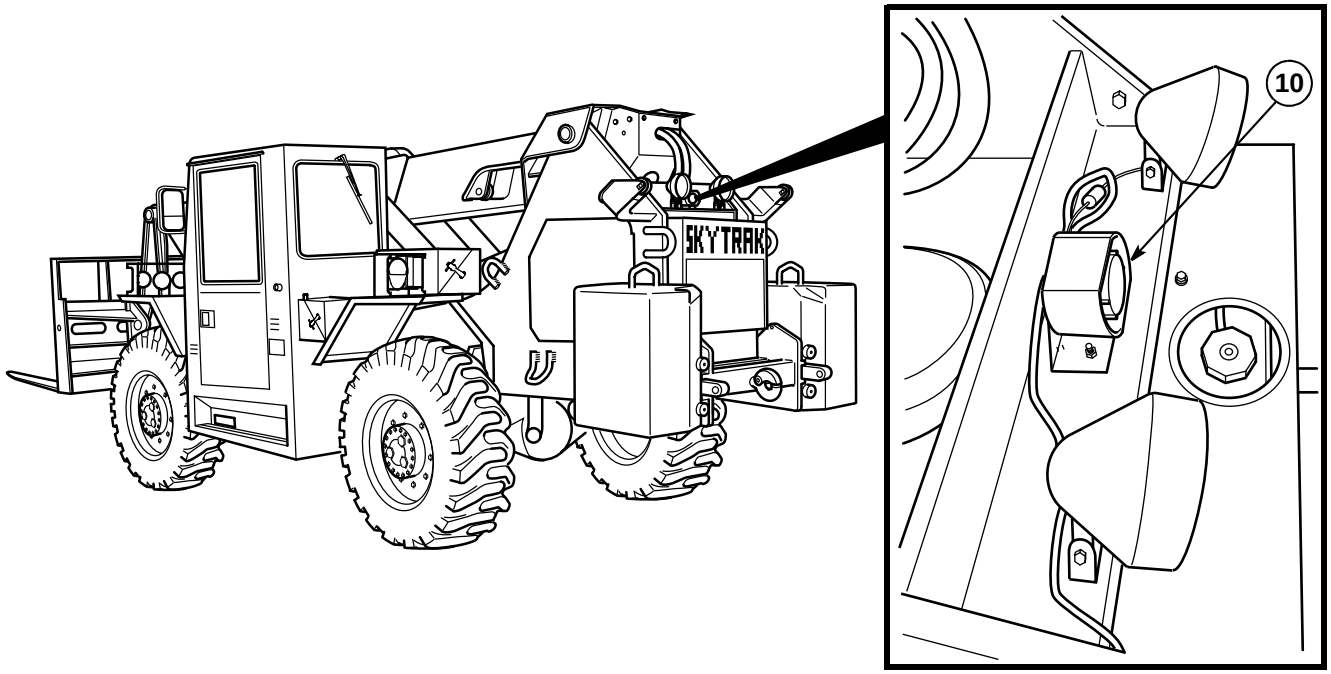
Key	Control/Indicator	Function
1	Engine Start Switch	Controls current flow from the batteries to the electrical system. In the OFF position, the switch disconnects the flow of current between the battery and the electrical system. Also, the switch is used to shut the engine down. Once turned to the OFF position, the fuel solenoid on the fuel injection pump is deactivated, stopping the flow of fuel from the pump to the injectors. In the RUN position, all controls and indicators are operable, and the emergency steering pump is activated. In the START position, only the engine starting motor is engaged and the fuel solenoid activated.
2	Steer Select Control	Allows the operator to control the steering mode: CRAB (left position), TWO WHEEL (center position), and FOUR WHEEL (right position).
3	Horn Button	Press the button to sound the horn.
4	Operator's Seat	A lever on the front of the seat controls the back and forth movement. Release the lever and slide seat forward or backward to suit. A knob underneath the seat adjusts seat suspension tension. Turn the wheel clockwise to stiffen seat suspension, and counterclockwise to soften seat suspension. Heater/air conditioner vents on the lower right side of the seat can be opened, closed, or turned. Seat height can be adjusted to any of three positions. Raise the seat by grasping seat bottom and pulling upward to one of three detent positions. Once in the highest detent position, lower the seat by raising all the way and then lowering seat fully.

Table 2-7. Miscellaneous Controls Operator Seat and Foot Pedals - CONT.



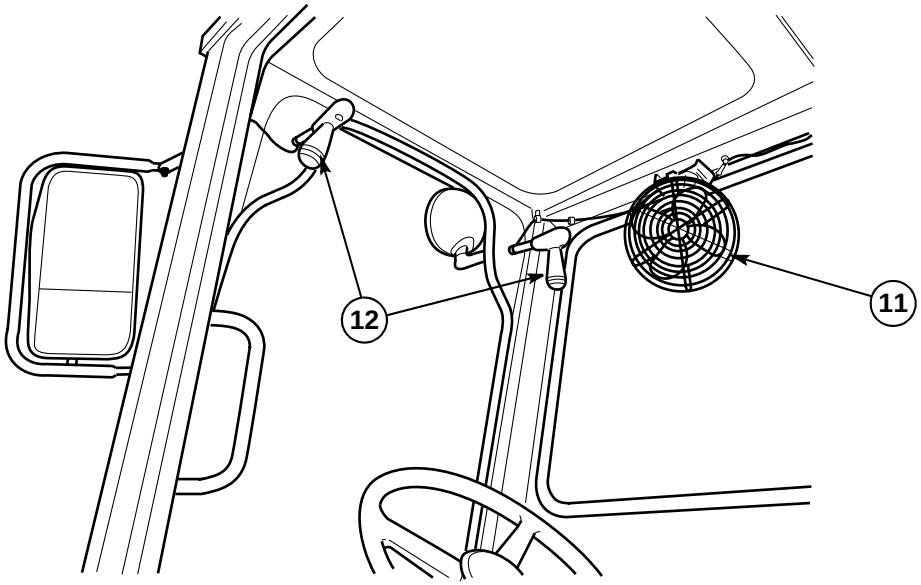
Key	Control/Indicator	Function
5	Accelerator Pedal	Controls engine speed. Depress the pedal to increase engine speed. Release pressure on the pedal to decrease engine speed.
6	Brake Pedal	Applies the service brakes. Depress the pedal to actuate the disc brakes on all four wheels. The brake lights illuminate when this pedal is depressed if the service lighting control switch is in the STOP LIGHT or SERVICE DRIVE position.
7	Transmission Disconnect Pedal	Disconnects the transmission from the drive train and, after additional travel, engages the service brakes. Depressing this pedal allows the operator to increase the engine rpm without shifting to NEUTRAL, thereby accelerating hydraulic functions.
8	Steering Wheel Locking Cable	Automatically retracting steel cable used in conjunction with lock in tool box. When cable is looped around steering wheel and locked, prevents unauthorized personnel from steering the vehicle.
9	Heater/Air Conditioner Vents	Control the amount and directional flow of heated or cooled air to the operator. Opening, closing, or turning vents located in front, behind, or beneath the operator permits airflow to be regulated.

Table 2-7. Miscellaneous Controls Operator Seat and Foot Pedals - CONT.



Key	Control/Indicator	Function
		WARNING The back-up alarm does not operate in blackout lighting mode. Use extreme caution when backing in blackout mode. Do not disconnect the back-up alarm at any time, or injury or death to personnel could result. **CAUTION** Do not allow direct water pressure into the back-up alarm when washing the ATLAS vehicle. Excessive water will interfere with the back-up alarm operation.
10	Back-up Alarm	Activated whenever the range select lever is placed in reverse travel position. The alarm does not operate in blackout lighting mode.

Table 2-7. Miscellaneous Controls Operator Seat and Foot Pedals - CONT.



Key	Control/Indicator	Function
11	Defroster Fans	Turn front and/or rear fan switch to ON position to remove moisture or frost from front and rear windows.
12	Front Floodlight Controls	Adjusts front floodlight positions. Rotate the handle to turn the floodlight. Turn the handle assembly to change the axis of the floodlight's rotation.

Section II. PREVENTIVE MAINTENANCE

2-2. GENERAL

Your Preventive Maintenance Checks and Services table lists the inspections and care of your equipment required to keep it in good operating condition.

2-3. PMCS PROCEDURES

a. The Item Number column of your PMCS is the source for the number used on the TM Number Column on DA Form 2404.

b. The Interval column of your PMCS table tells you when to do a certain check or service.

(1) Before you operate. Always keep in mind the CAUTIONS and WARNINGS. Perform your before (B) PMCS prior to the equipment leaving the containment area or performing its intended mission.

(2) While you operate. Always keep in mind the CAUTIONS and WARNINGS. Perform your (D) PMCS when the equipment is being used in its intended mission.

(3) After you operate. Be sure you perform your after (A) PMCS after the equipment has been taken out of its mission mode or returned to the containment area.

(4) Do your weekly (W) PMCS once a week.

c. The Procedure column of your PMCS table tells you how to do the required checks and services. Carefully follow these instructions. If you do not have the tools, or if the procedure tells you to, have Unit Maintenance do the work.

d. If your equipment does not perform as required, refer to the manual troubleshooting section for possible problems. Report any malfunctions or failures on the proper DA Form 5988-E or refer to DA Pamphlet 738-750.

NOTE

The terms ready/available and mission capable refer to the same status: Equipment is on hand and is able to perform its combat missions (AR 700-138).

e. Equipment Is Not Ready/Available If column: This column tells you when and why your equipment cannot be used.

f. Always do your PMCS in the same order so it gets to be a habit. Once you've had some practice, you'll spot anything wrong in a hurry.

g. When you do your PMCS, take along a rag or two.

h. While performing PMCS, observe CAUTIONS and WARNINGS preceding those operations which could endanger your safety or result in damage to the equipment.

WARNING

- Dry cleaning solvent MIL-PRF-680 Type III is an environmentally compliant and low toxic material. However, it may be irritating to the eyes and skin. The use of protective gloves and goggles is suggested. Use in well-ventilated areas. Keep away from open flames and other sources of ignition.

- NOTE: P-D-680 Type II is no longer in use and has been replaced by MIL-PRF-680 Type III.

(1) Keep it clean: dirt, grease, oil and debris only get in the way and may cover up a serious problem. Clean as you work and as needed. Use drycleaning solvent (P-D-680) to clean metal surfaces. Use soap and water when you clean rubber or plastic material.

(2) Bolts, nuts and screws: Check that they are not loose, missing, bent or broken. You can't try them all with a tool, of course, but look for chipped paint, bare metal or rust around bolt heads. Tighten any bolt, nut or screw that you find loose.

(3) Welds: Look for loose or chipped paint, rust or gaps where parts are welded together. If you find a bad weld, report it to Unit Maintenance.

2-3. PMCS PROCEDURES (CONT)

(4) Electric wires and connectors: Look for cracked or broken insulation, bare wires and loose or broken connectors. Tighten loose connections and make sure the wires are in good condition.

(5) Hoses and fluid lines: Look for wear, damage and leaks. Make sure clamps and fittings are tight. Wet spots show leaks, but a stain around a fitting or connector can also mean a leak. If leakage comes from a loose fitting or connector, tighten the fitting or connector. If something is broken or worn out, either correct it or report it to Unit Maintenance.

(6) Vehicle must be on level ground in order to get correct fluid level measurement.

i. It is necessary for you to know how fluid leaks affect the status of your equipment. The following are definitions of the types/classes of leakage you need to know to be able to determine the status of your equipment. Learn and be familiar with them and REMEMBER - when in doubt, notify your supervisor.

CAUTION

Equipment operation is allowable with minor leakages (Class I or II). Of course, consideration must be given to fluid capacity in the item/system being checked/inspected. When operating with Class I or II leaks, continue to check fluid levels as required on your PMCS.

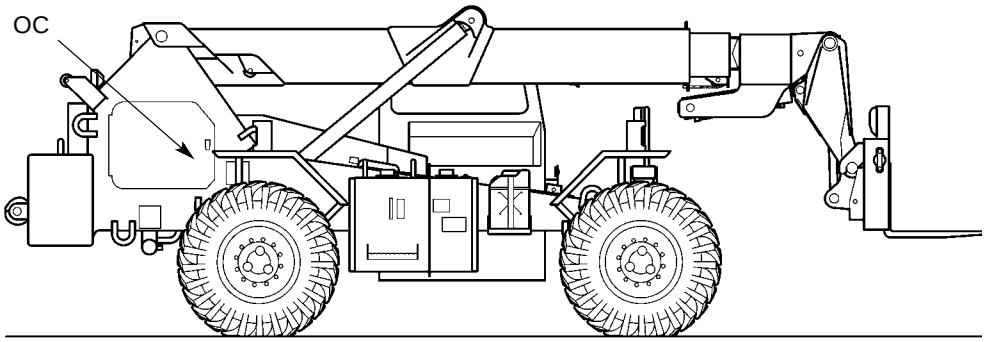
Class I	Seepage of fluid (as indicated by wetness or discoloration) not great enough to form drops.
Class II	Leakage of fluid great enough to form drops, but not enough to cause drops to drip from the item being checked/inspected.
Class III	Leakage of fluid great enough to form drops that fall from the item being checked/inspected.

2-4. LUBRICATION INSTRUCTIONS

a. Refer to TM 10-3930-673-20-1.

b. See the following diagram for operator lubrication.

FUEL/WATER SEPARATOR
Drain.
Clean canister during each filter change.



2-4. LUBRICATION INSTRUCTIONS (CONT)

KEY								
LUBRICANTS		CAPACITIES	EXPECTED TEMPERATURES					INTERVALS (Hours of Normal Operation)
			Above –10°F (Above –23°C)	Below –10°F (Below –23°C)	Above +40°F (Above +4°C)	Below +40°F (Below +43°C)		
OE/HDO (MIL-L-2104)	LUBRICATING OIL, Engine	15 qt (14 l)			OE/HDO 10w/30 CC/CD	OEA	For Arctic Operation Refer to FM 9-207	500 or AOAP
	Engine Crankcase							
	Oil Can Points							
	Transmission	5.5 gal (20.8 l)	OE/HDO 10	OEA				250
	Transmission Disconnect Master Cylinder	As Req.	OE/HDO 10	OEA				250
OEA (MIL-L-46167A)	Hydraulic System	56.6 gal (214.2 l)			OE/HDO 10	OE/HDO 10		250
	Oil, Engine, Arctic							
GO (MIL-L-2105D)	LUBRICATING OIL, Gear, Multipurpose	10.6 qt (10 l) (each)			GO 80/90	GO 80/90		250
	Differential	18 qt (17 l)						
	Planetary Hubs	2.7 qt (2.6 l) (each)			GO 80/90	GO 80/90		250
	TEFLON DRY LUBE, Fork Shaft and Fork Wear Pads	As Req.						50 (Weekly)
GAA (MIL-G-10924)	GREASE, Automotive and Artillery Carriage Tilt Cylinder & Carriage Pivot Pins	As Req.	GAA ALL TEMPERATURES					50 See Note 1 (weekly)
	Hoist Cylinder, Attachment Pivot Pins, & Towing Pintle	As Req.						50 (weekly)
	Propeller Shaft Slip Joints & U-Joints (Front and Rear)	As Req.						500 (semi-annually)
	Tie Rod Ends	As Req.						50 (weekly)
	Axle Carrier Pins	As Req.						50 (weekly)
	Steering Knuckle Bearings & Joints	As Req.						50 (weekly)

2-4. LUBRICATION INSTRUCTIONS (CONT)

KEY								
LUBRICANTS		CAPACITIES	EXPECTED TEMPERATURES					INTERVALS (Hours of Normal Operation)
			Above –10°F (Above –23°C)	Below –10°F (Below –23°C)	Above +40°F (Above +4°C)	Below +40°F (Below +43°C)		
	Brake Pedal & Transmission Disconnect Pedal Counter Shaft	As Req.	GAA ALL TEMPERATURES				For Arctic Operation Refer to FM 9-207	50 (weekly) See Note 1
	Transmission Input Shaft Bearing, Slip Joint & U-Joint	As Req.						250
	Boom Extent & Boom Retract Chain Sheaves	As Req.						50 See Note 1 (weekly)
	Boom Pivot & Boom Hoist Cylinder Pins	As Req.						50
	Frame Tilt Cylinder Pins	As Req.						50
	Steering Cylinders	As Req.						250

NOTES

1. LUBRICATION. During adverse weather or abnormal dusty conditions, lubrication may require daily servicing.
2. The lubricating points for the brake pedal and transmission disconnect pedal counter shaft are located under the cab (GAA).
3. Lubricate all hinges and door latches with a hand oiler (OE/HDO).
4. Check the differential oil levels while vehicle is on a level surface. Oil should be to the bottom of the check and fill hole (GO, or GAA, see Card 19).
5. Lubricate after fording operations (GAA).
6. **WARNING – Do not stand under the attachment and carriage assembly during lubrication services**. To lube the carriage lube points and tilt cylinder lower points, raise the fork assembly 48 in. (122 cm) and tilt the carriage assembly forward 90°. To lube the tilt cylinder's head pivot pin, place the level forks/carriage firmly on the ground (GAA).
7. During adverse weather, dusty or sand conditions, change transmission oil and filter element at 250 hour intervals. For normal off-highway operation, for operation under rapid change in ambient temperature, or for operation in presence of chemical fumes, change at 375 hour intervals. Use MIL-L-2104D hydraulic transmission fluid when operating the vehicle in temperatures above –10°F (–23°C), and MIL-L-46167A transmission fluid when operating in temperatures below –10°F (–23°C).
8. To lube the steering knuckle joint, the vehicle may have to be moved forward or backwards to align grease fitting with access hole. If the fitting is aligned with the access hole but grease gun will not go on fitting, turn the wheels right or left until grease gun fits on grease fitting (GAA).
9. Raise the boom to approximately 15° to lubricate the boom hoist cylinder pins (GAA).
10. Drain hydraulic reservoir every 2000 hours. Change hydraulic oil filter and add oil (OE/HDO) to reservoir until oil is visible in sight gage. Operate hydraulic system and check oil level again.

2-4. LUBRICATION INSTRUCTIONS (CONT)

CHART A. ENGINE

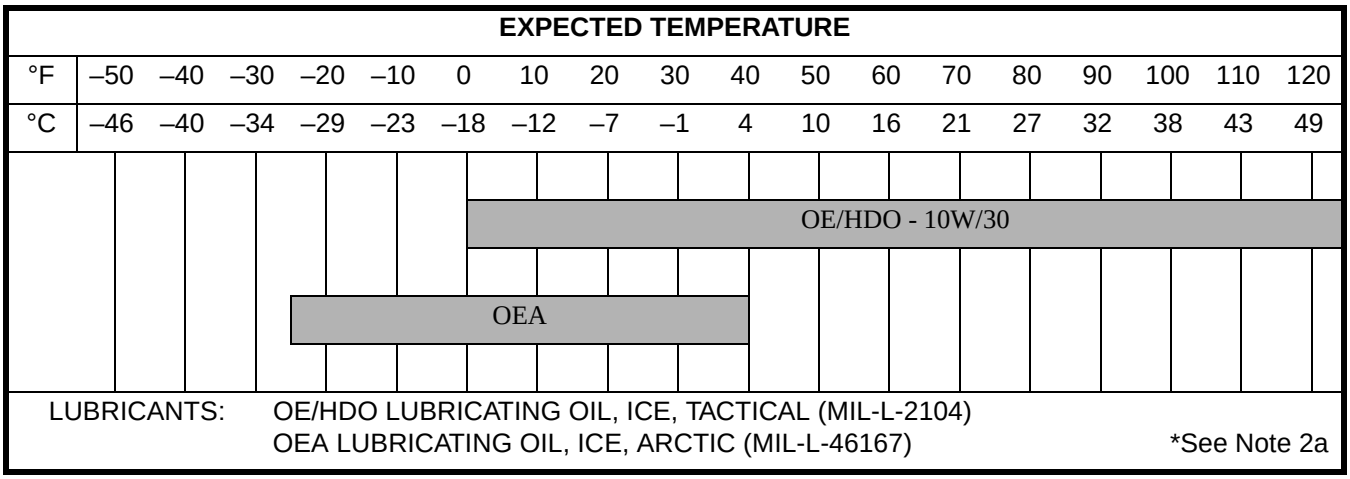

EXPECTED TEMPERATURE
°F –50 –40 –30 –20 –10 0 10 20 30 40 50 60 70 80 90 100 110 120
°C –46 –40 –34 –29 –23 –18 –12 –7 –1 4 10 16 21 27 32 38 43 49
OE/HDO - 10W/30
OEA
LUBRICANTS: OE/HDO LUBRICATING OIL, ICE, TACTICAL (MIL-L-2104)
OEA LUBRICATING OIL, ICE, ARCTIC (MIL-L-46167)
*See Note 2a

CHART B. TRANSMISSION/HYDRAULIC

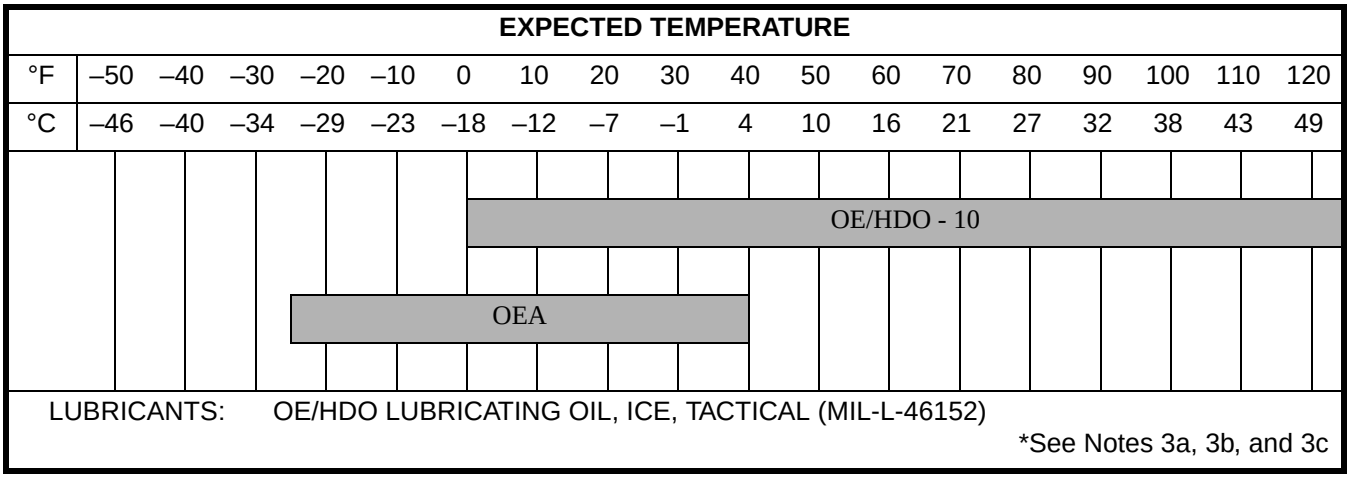

EXPECTED TEMPERATURE
°F –50 –40 –30 –20 –10 0 10 20 30 40 50 60 70 80 90 100 110 120
°C –46 –40 –34 –29 –23 –18 –12 –7 –1 4 10 16 21 27 32 38 43 49
OE/HDO - 10
OEA
LUBRICANTS: OE/HDO LUBRICATING OIL, ICE, TACTICAL (MIL-L-46152)
*See Notes 3a, 3b, and 3c

CHART C. DIFFERENTIAL

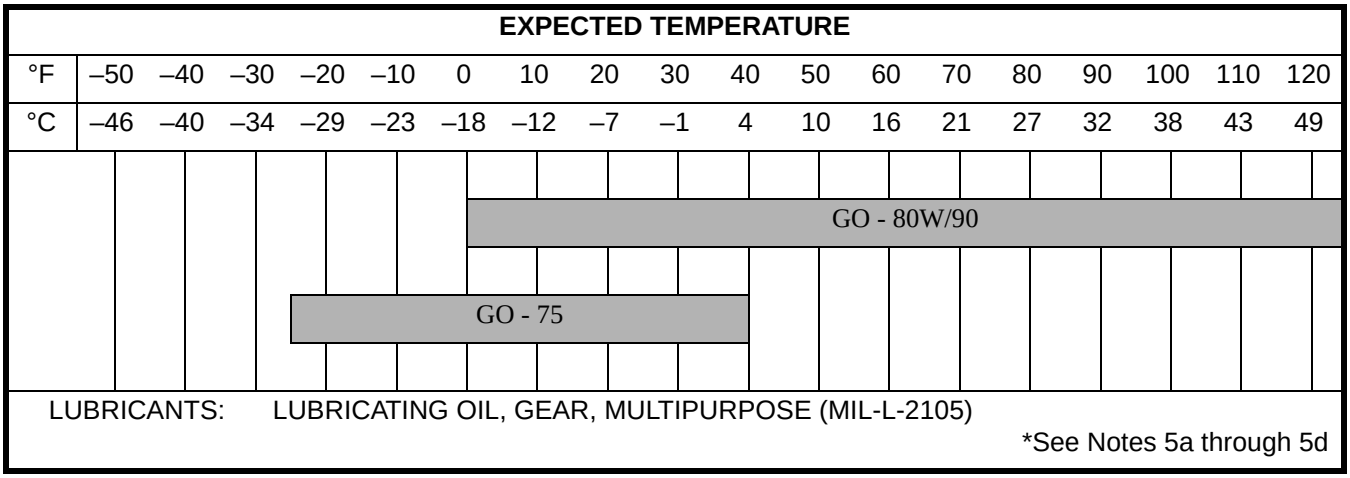

EXPECTED TEMPERATURE
°F –50 –40 –30 –20 –10 0 10 20 30 40 50 60 70 80 90 100 110 120
°C –46 –40 –34 –29 –23 –18 –12 –7 –1 4 10 16 21 27 32 38 43 49
GO - 80W/90
GO - 75
LUBRICANTS: LUBRICATING OIL, GEAR, MULTIPURPOSE (MIL-L-2105)
*See Notes 5a through 5d

Table 2-8. Operator Preventive Maintenance Checks and Services

Item No.	Interval	Location Item to Check/ Service	Procedure	Not Fully Mission Capable if:
			IMPORTANT PERFORM WEEKLY (W) AS WELL AS BEFORE (B) OPERATOR'S PMCS IF: 1. You are the assigned operator and have not operated vehicle since the last weekly checks. 2. You are operating vehicle for the first time. **WARNING** Personnel hearing can be PERMANENTLY DAMAGED if exposed to constant high noise levels of 85 dB (A) or greater. Wear approved hearing protection devices when operating or working within 61 ft (19 m) of vehicle when engine is running. Personnel exposed to high noise levels shall participate in a hearing conservation program in accordance with TB MED 501. Hearing loss occurs gradually but becomes permanent over time. **WARNING** Unless otherwise specified, perform all maintenance procedures with all equipment lowered to the ground, transmission in neutral, parking brake applied and engine shut off. Failure to follow these precautions could result in injury or death to personnel.	

Table 2-8. Operator Preventive Maintenance Checks and Services - CONT.

Item No.	Interval	Location Item to Check/ Service	Procedure	Not Fully Mission Capable if:
			CAUTION New vehicle (break-in) maintenance is required on the ATLAS at 20 hours and 50 hours. Refer to Para 2-6 and contact Unit Maintenance to avoid early wear or damage to the forklift and possible voidance of the warranty.	
1	Before/After	Exterior or Forklift	a. Check for oil, fuel, coolant and hydraulic oil leaks.	Class III leaks are evident.
	Before/After		b. Check Cab/Roll Over Protective Structure (ROPS)/Falling Object Protective Structure (FOPS) and vehicle frame for obvious damage, cracks, bends and evidence of loose mounting hardware.	Obvious damage, cracks, bends in weldments.
	Before/After		c. Inspect boom, attachment, 6K and/or 10K carriage, and forks for cracked, bent or broken members.	Boom, attachment, 6K and/or 10K carriage, or forks are bent, cracked, broken or missing.
	Before/After		d. Check exterior wiring and connectors for secure mounting, frayed, broken or burned wires.	Wiring is frayed, broken or burned.
	Before/After		e. Check frame tilt stops for cracks, bends or weld and other damage.	Any obvious damage, cracks or bends in weldment.
	Before/After		f. Check that boom hoses and electrical cable are snug against hose guide and not crossed.	Hoses or cables are crossed or obviously loose.
2	Before/After	Tires, Wheels, and Flexible Brake Lines	a. Check tires for damage (i.e., cuts, gouges, foreign matter), low tire pressure (refer to TM 9-2610-200-24). Maintain tire pressure at 65 psi.	One or more tires unserviceable.
	Before/After		b. Check wheels for damage and loose or missing mounting nuts.	Cracks, loose or missing mounting nuts.
	Before/After		c. Check flexible brake lines for signs of wear, cuts or damage.	Any signs of wear, cuts or damage.

Table 2-8. Operator Preventive Maintenance Checks and Services - CONT.

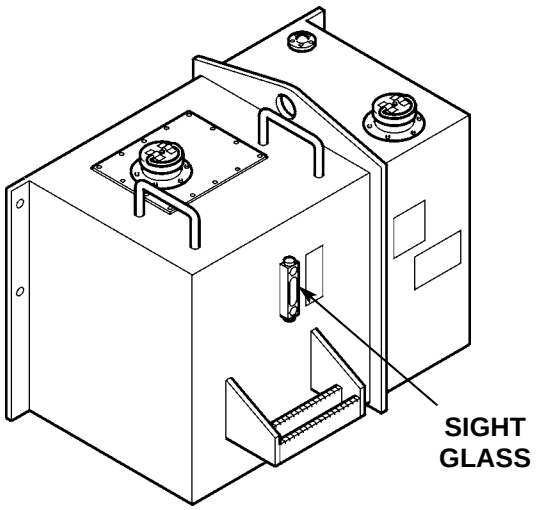
Item No.	Interval	Location Item to Check/ Service	Procedure	Not Fully Mission Capable if:
				
3	Before	Hydraulic Tank/ Reservoir	With all cylinders retracted, check oil level in tank. Maintain oil level between marks in the sight glass.	

Table 2-8. Operator Preventive Maintenance Checks and Services - CONT.

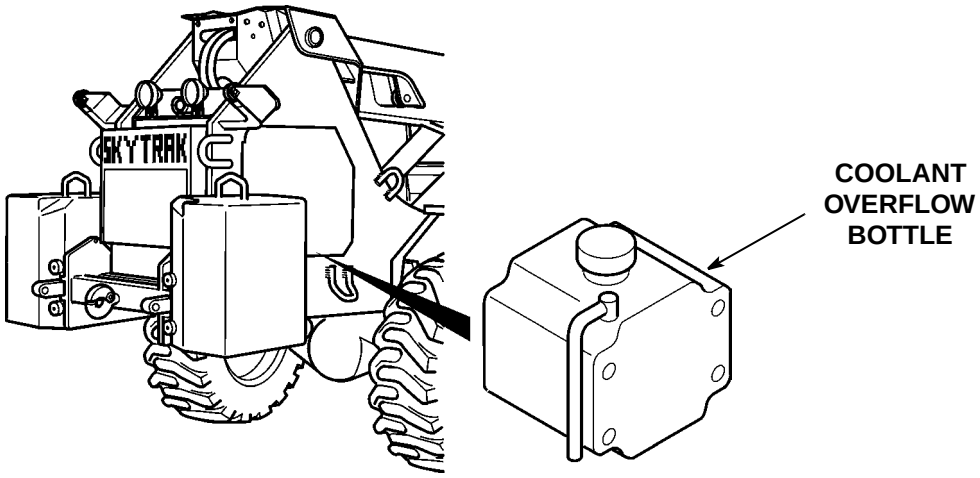
Item No.	Interval	Location Item to Check/ Service	Procedure	Not Fully Mission Capable if:
				
4		Radiator	**WARNING** The cooling system operates under pressure which is controlled by the radiator cap. It is dangerous to remove the cap while system is hot, because hot steaming gases will escape and burn you. Always allow system to cool, then turn the cap to the first stop and allow the pressure to escape before removing the cap completely. Use coolant overflow bottle to fill or check coolant level. If coolant is not visible in overflow bottle, system must be refilled through the radiator cap.	
	Before		a. Check coolant level in the overflow bottle. Maintain level approximately 1/3 full to 2/3 full (2 qts).	
	Before		b. Visually check radiator for damage or obstruction. Remove any obstruction.	Radiator is leaking.

Table 2-8. Operator Preventive Maintenance Checks and Services - CONT.

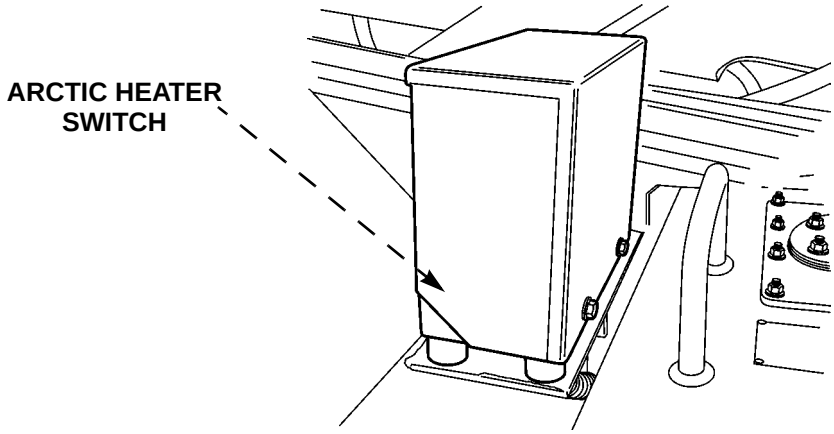
Item No.	Interval	Location Item to Check/ Service	Procedure	Not Fully Mission Capable if:
				
5	Before	Arctic Heater	a. Open left engine access door.	
	Before		b. Ensure that coolant valve at left-rear of engine is fully open.	
	Before		c. Move arctic heater switch to the ON position. Audible sound from coolant pump inside arctic heater indicates pump is working.	Coolant pump not operating. (If mission requires use of arctic heater).
	Before		d. Check arctic heater for security of mounting and obvious damage.	Damage present that would prevent proper operation. (If mission requires use of arctic heater).
	Before		e. Check coolant hoses for leaks, cuts, loose clamps and other obvious damage.	Class III leak is evident.
	Before		f. Check valve for leaks.	Class III leak is evident.

Table 2-8. Operator Preventive Maintenance Checks and Services - CONT.

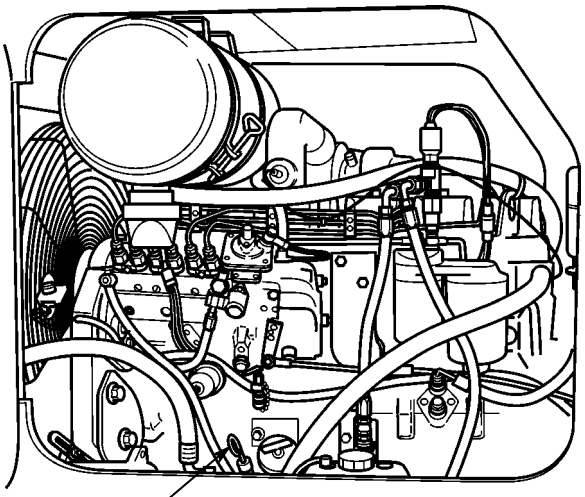
Item No.	Interval	Location Item to Check/ Service	Procedure	Not Fully Mission Capable if:
			 ENGINE OIL LEVEL DIPSTICK	
6	Before	Engine Oil Level	Check engine oil level on dipstick. Maintain oil level to between the ADD and FULL marks.	
7	Before	Hydraulic Cylinders	Check external hydraulic lines and fittings for damage and leaks.	Class III leaks are evident.
8		Batteries	**WARNING** Do not smoke or allow any open flame or spark in the vicinity while checking or filling batteries. The batteries generate hydrogen gas, a highly explosive gas. Injury or death to personnel can result.	
	Before		a. Check batteries and battery box for corrosion and obvious damage.	Corrosion damage to batteries.

Table 2-8. Operator Preventive Maintenance Checks and Services - CONT.

Item No.	Interval	Location Item to Check/ Service	Procedure	Not Fully Mission Capable if:
	Before		b. Check battery electrolyte level. If the electrolyte level is below the top of the battery plates, notify Unit Maintenance.	
9	Before	Windows	Check windows for obvious damage and broken or cracked windows.	Vision is distorted due to crack in windshield.
10	Before	Seat and Seat Belt	a. Check seat belt for damage.	Seat belt torn, seat belt retractor inoperative.
	Before		b. Check seat adjustment latch.	Seat latch inoperative or broken.
	Before		c. Check seat suspension adjuster.	Seat adjuster inoperative or broken.
			CAUTION The windshield wipers should not be operated on dry windshields for extended periods of time.	
11	Before	Windshield Wipers	a. Check windshield wipers for proper operation.	Wipers inoperative.
	Before		b. Check for missing or damaged wiper blades. If blades are missing or damaged, notify Unit Maintenance.	
	Before		c. Check operation of front and rear windshield wiper washers. Maintain windshield wiper washer fluid level to top of reservoir.	
12	Before	Exterior Lights	Check exterior lights for proper operation.	
13	Before	Horn and Back-up Alarm	With engine start switch in the ON position, move travel select lever to reverse. Check for back-up alarm operation.	Back-up alarm inoperative.
14	Before	Instrument Panel and Controls	a. Inspect the instrument panel for broken glass and unserviceable gauges.	Any of the following gages are unreadable: • Water temperature. • Engine oil pressure. • Transmission oil temperature.

Table 2-8. Operator Preventive Maintenance Checks and Services - CONT.

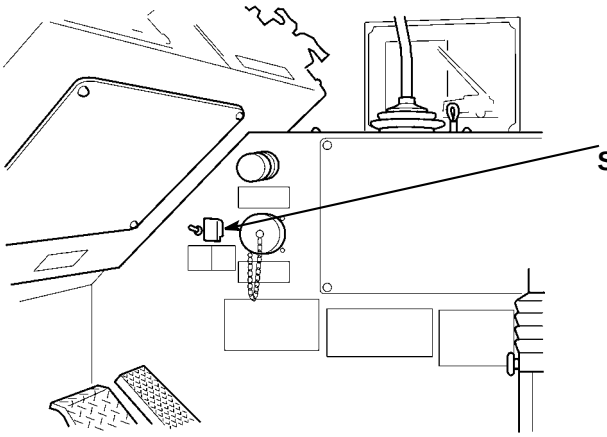
Item No.	Interval	Location Item to Check/ Service	Procedure	Not Fully Mission Capable if:
	Before		b. Press lenses to test warning lights. **NOTE** Check Nos. 14.1,15, 16 and 17 are performed with the engine running, prior to the equipment leaving the containment area or performing its intended mission.	Low brake pressure warning light bulb does not illuminate.
14.1	Before	Emergency Steering Pump	Place engine start switch in the ON position and emergency steer switch in ON position (switch down and red cover down). Turn steering wheel slightly left and right in any steering mode. Observe that wheels are turning.	Emergency steering pump not operational.
				
15	Before	Systems Operational Check	a. Operate two wheel, four wheel, and crab steering fully in one direction and then in the opposite direction. Check for proper and smooth operation.	Erratic or noisy operation. Any steering mode not operational.
	Before		b. Depress the service brake pedal and check to ensure that pedal is firm and does not depress completely to floor.	Pedal is spongy or goes to floor.
	Before		c. Place transmission in forward gear and allow vehicle to move. Operate the service brakes. Vehicle should stop.	Vehicle does not stop.
	Before		d. With parking brake applied, place travel select control lever in third gear. Vehicle should not move.	Parking brake does not hold vehicle.

Table 2-8. Operator Preventive Maintenance Checks and Services - CONT.

Item No.	Interval	Location Item to Check/ Service	Procedure	Not Fully Mission Capable if:
			WARNING • Before operating the boom, use care to ensure that boom does not come near overhead wires, power lines or structures. If boom contacts overhead power lines or structures, injury or death to personnel could result. If lines are near to your operating area, notify your supervisor prior to starting work. • Do not raise or extend the boom unless the frame is level. Failure to comply could cause the load to drop or machine to tip, resulting in injury or death to personnel.	
	Before		e. Lubricate attachment pivot pin, quick attach pivot pin, carriage tilt cylinder pivot pins, and attachment lift cylinder pins with grease.	
	Before		f. Operate the boom extend, retract, raise and lower. Check for smooth operation.	Boom operation is erratic. Boom does not function.
	Before		g. Operate the frame tilt from full left to full right.	Frame tilt is erratic or does not tilt.
	Before		h. Check for corrosion on fork shaft. Wipe fork shaft with dry rag. Clean fork shaft with nylon bristle brush and apply teflon dry lube to shaft. If corrosion is still not removed, request Unit Maintenance inspect, clean, and lubricate with Teflon Dry Lubricant (Item 2.5, Appendix D).	
	Before		i. Check fork movement, right and left, for proper operation.	Neither fork operates.

Table 2-8. Operator Preventive Maintenance Checks and Services - CONT.

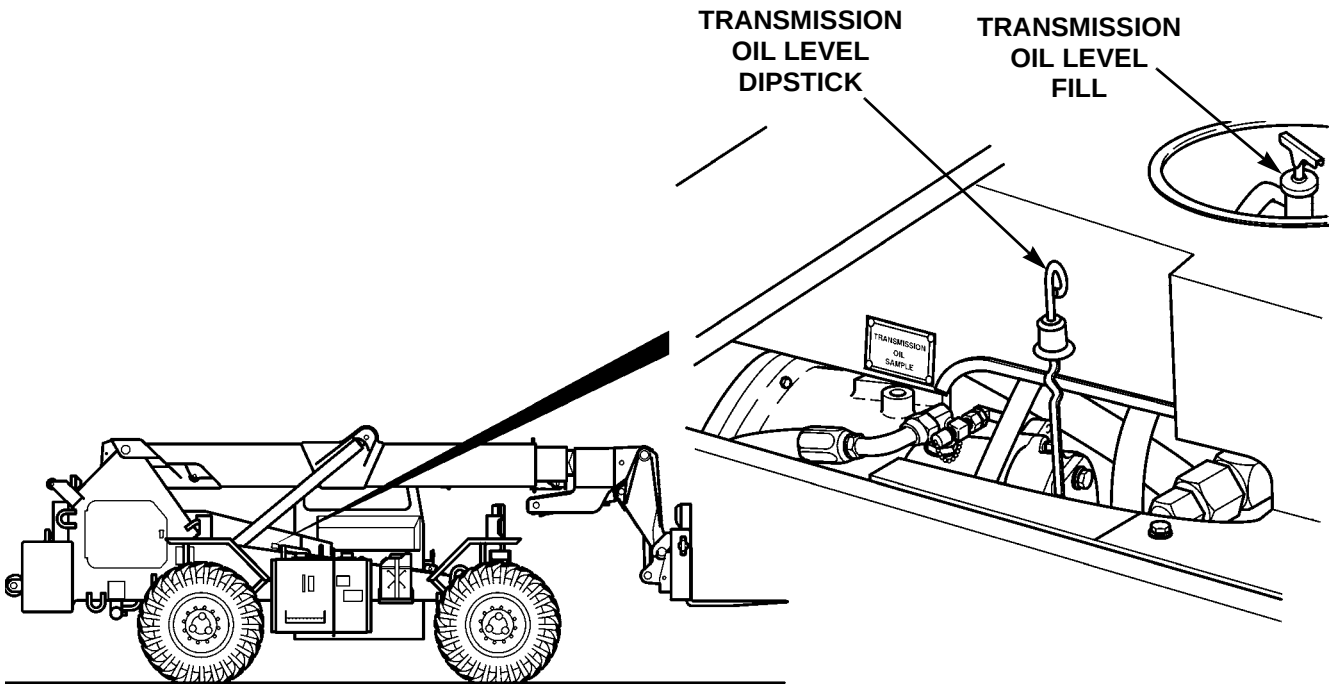
Item No.	Interval	Location Item to Check/ Service	Procedure	Not Fully Mission Capable if:
				
16	Before	Transmission Oil Level	With engine running and transmission at normal operating temperature, check oil level on dipstick. Maintain oil level between the "ADD" and the "FULL" marks.	
17	During	Gages and Warning Lights	Monitor all gages and warning lights during vehicle operation.	
			a. Water temperature 180° – 210° F.	Water temperature above 210° F.
			b. Normal engine oil pressure 30 psi – 90 psi.	Engine oil pressure less than 10 psi (minimum allowable at idle).
			c. Transmission oil temperature does not exceed 250° F.	Transmission oil temperature exceeds 250° F.
			d. Battery voltage indicator in safe zone, 24 – 28.5 volts.	Battery voltage indicator not in safe zone.

Table 2-8. Operator Preventive Maintenance Checks and Services - CONT.

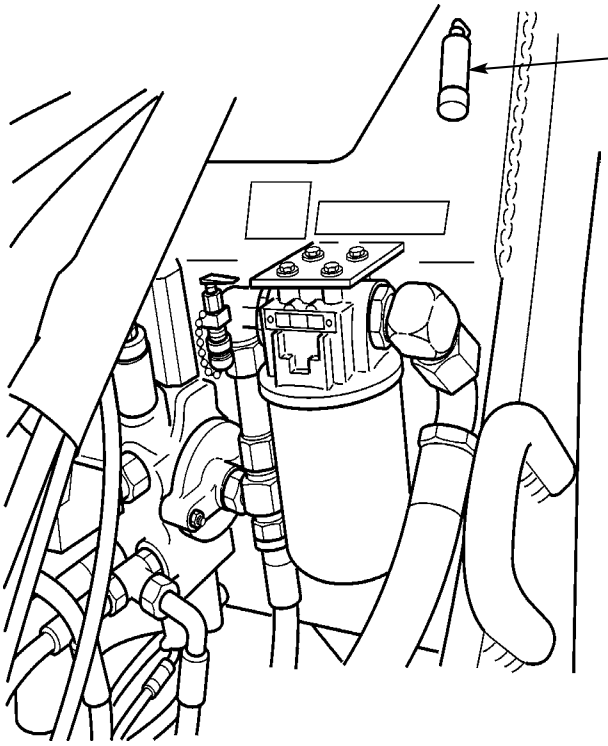
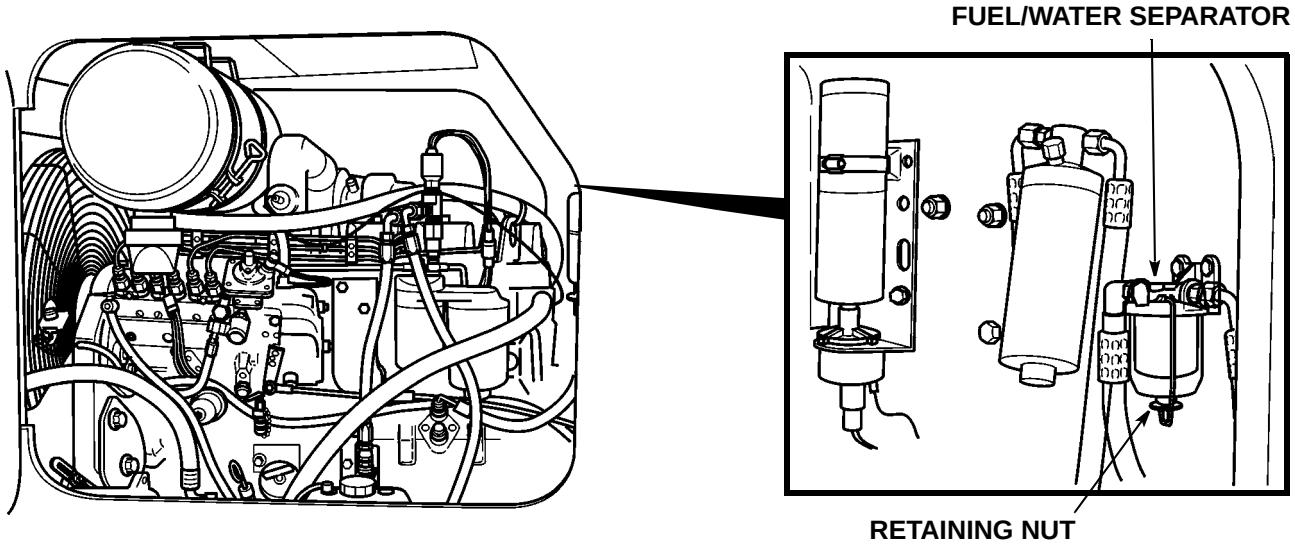
Item No.	Interval	Location Item to Check/ Service	Procedure	Not Fully Mission Capable if:
				
			When operating in desert or extremely dusty conditions, clean the primary air cleaner element after every 4 hours of operation.	
18	After	Air Filters	Check air cleaner indicator.	Indicator shows fully red on gauge.

Table 2-8. Operator Preventive Maintenance Checks and Services - CONT.

Item No.	Interval	Location Item to Check/ Service	Procedure	Not Fully Mission Capable if:
				
19	After	Fuel/Water Separator	Drain water from the water separator: a. Loosen retaining nut at bottom of sediment bowl. b. Pull retaining bracket forward. c. Remove sediment bowl and discard contents. d. Re-install sediment bowl. e. Swing retaining bracket under sediment bowl. f. Tighten retaining nut finger tight.	
20	Weekly	Exhaust System	a. Check exhaust system for loose or missing clamps or hardware.	Any missing hardware or evidence of leaks.
	Weekly		b. Check for evidence of leaks at all joints and connections.	
21	Weekly	Engine Lubrication System	Check for oil leaks at the valve covers, turbocharger oil line and engine oil filter.	Class III leaks are evident.
22	Weekly	Fork Wear Pad Screws	Check fork wear pad screws. If screws are missing, loose, bent or broken, notify Unit Maintenance.	

Section III. OPERATION PROCEDURES

2-5. GENERAL

It is essential that the operator know how to perform every operation of which the vehicle is capable. This section gives instructions on starting and stopping the vehicle, on the basic motions of the vehicle, and how to use these instructions to perform specific tasks for which the equipment was designed.

2-6. NEW VEHICLE BREAK-IN

Controlled break-in is the ideal fitting of all internal moving metal parts. Using the proper oil and preventive maintenance program during this period will result in long life of the engine.

WARNING

Personnel hearing can be PERMANENTLY DAMAGED if exposed to constant high noise levels of 85 dB (A) or greater. Wear approved hearing protection devices when operating or working within 61 ft (19 m) of vehicle when engine is running. Personnel exposed to high noise levels shall participate in a hearing conservation program in accordance with TB MED 501. Hearing loss occurs gradually but becomes permanent over time.

a. Starting the Engine. Refer to Para 2-7. Warm the engine to operating temperature (180° – 190° F) before placing the engine under load.

b. Operation.

(1) Avoid constant speeds.

(2) Use the range select control lever to place the transmission in the appropriate gear to prevent engine lugging.

(3) Check the gages to ensure normal operation of the engine.

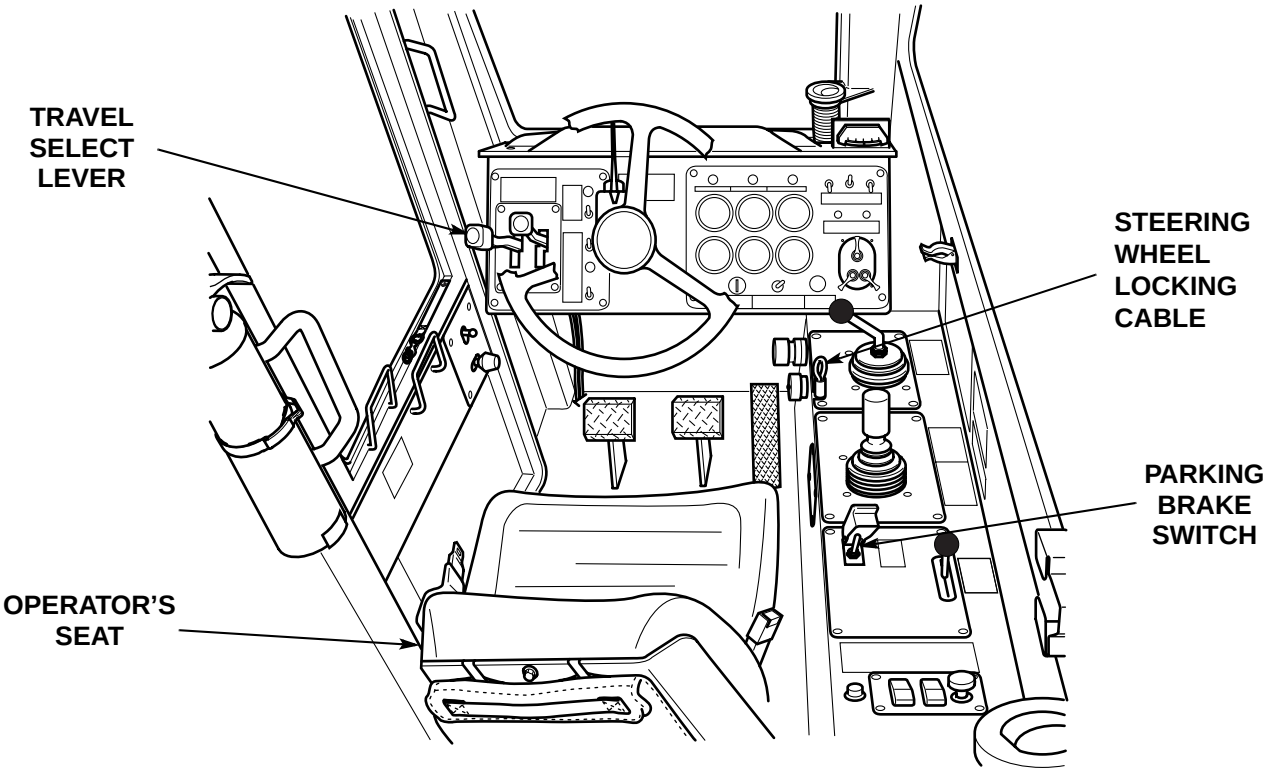
(4) Check the coolant level and fill as necessary.

(5) Check the oil level. Add oil as necessary to keep it at the correct level. Do not overfill the crankcase.

(6) After the first 20 hours of operation, transmission oil and the filter must be changed. Contact Unit Maintenance to change and lubricate with correct grade of lubricant according to the PMCS. After the first 50 hours of operation, contact Unit Maintenance to change the following items:

- Planetary gear oil,
- Hydraulic oil filter,
- Engine oil and filter,
- Differential oil.

2-7. STARTING THE ENGINE



a. Adjust the operator's seat and suspension so that when your seat belt is buckled you can still depress the foot pedals.

NOTE

Before starting the vehicle, ensure that the parking brake is engaged.

b. If the steering wheel is locked, unlock the steering wheel and allow the cable to slowly retract.

c. If the parking brake is not engaged, set the parking brake switch to ON.

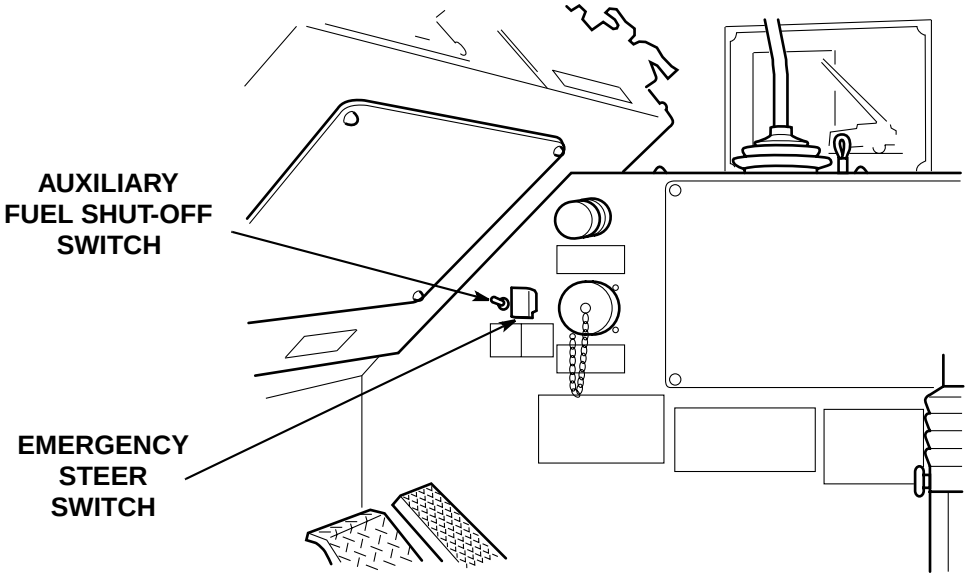
NOTE

Before starting the vehicle, ensure that the travel select lever is placed in Neutral, “N”.

d. If the travel select control is not in the neutral position, move the lever to Neutral, “N”.

e. On the first start of the day, check the neutral safety switch for proper operation.

(1) Place the travel select lever in the Forward, “F” position.



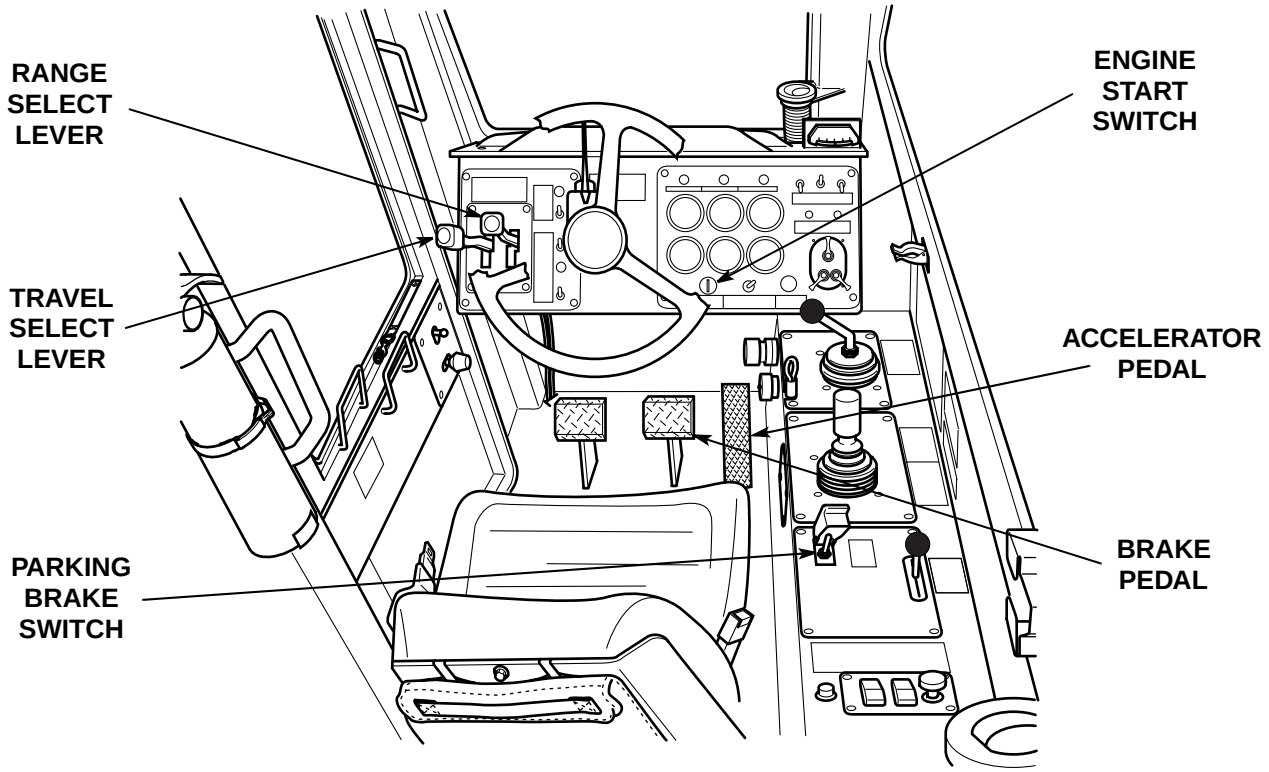
(2) Ensure that the auxiliary fuel shut-off switch is OFF (switch up).

WARNING

Do not operate vehicle with the emergency steer switch in the OFF position. If engine power is lost, there will also be a loss of emergency steering capability. Failure to follow this precaution could result in injury or death to personnel.

(3) Ensure that the emergency steer switch is ON (switch down, red cover down).

2-7. STARTING THE ENGINE (CONT)



CAUTION

If the engine should turn over, do not continue. This indicates that the neutral safety switch is defective.

(4) Turn the engine start switch to the START position. The engine should not turn over.

(5) Return the engine start switch to the OFF position.

(6) Return the travel select lever to the Neutral, “N” position.

(7) Move the auxiliary fuel shut-off switch to the ON position.

f. Depress the accelerator pedal to approximately half speed.

CAUTION

Do not crank the starting motor for more than 30 seconds at a time. Continuous cranking can overheat and damage starting motor.

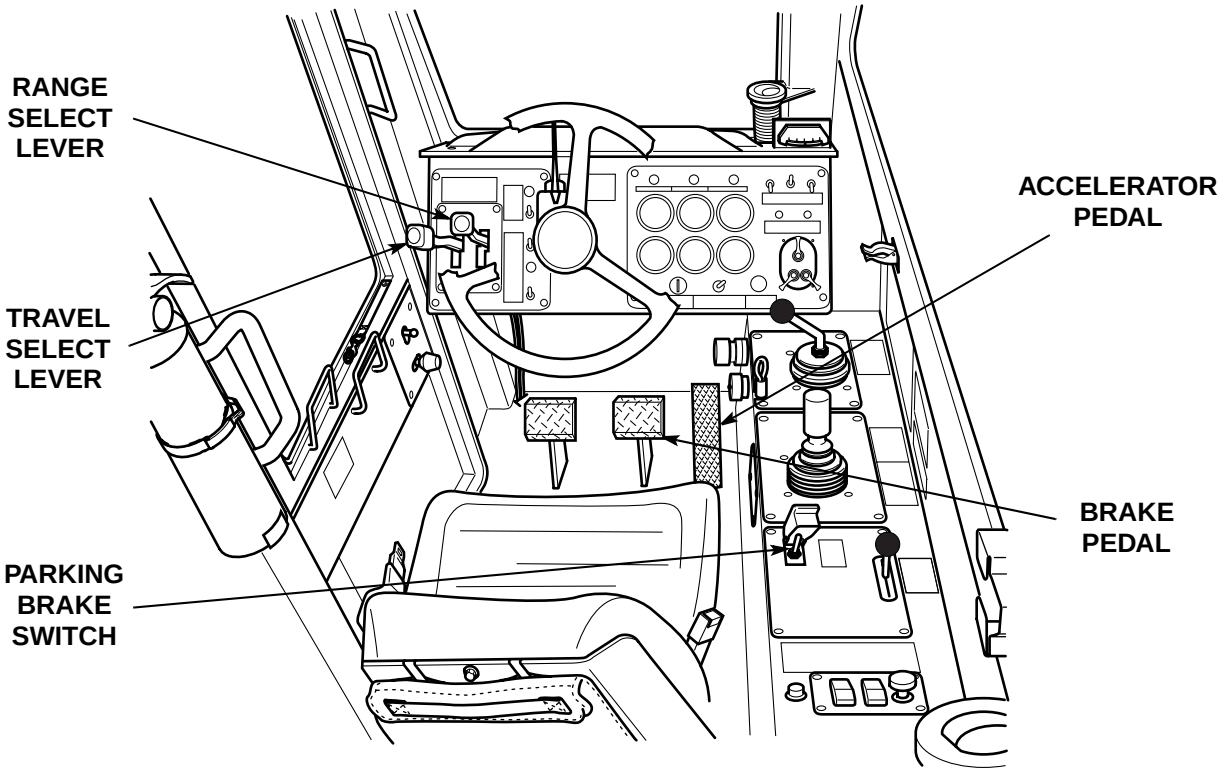
g. Turn the engine start switch clockwise to the START position. Release the switch as soon as the engine starts. If the engine fails to start on the first try, wait until engine and starter have come to a complete stop. Then, return the switch to the OFF position before attempting to start engine again.

CAUTION

- If coolant temperature exceeds 220° F or the warning light is illuminated, shut the engine down immediately. Do not operate vehicle continuously at a water temperature above 210° F or below 140° F.
- Should oil pressure fluctuate or drop, or if the warning light is illuminated, stop the engine and find the cause. Do not operate the engine at oil pressure lower than 10 psi.
- If oil pressure does not register within 15 seconds after the engine starts, stop the engine or serious damage may occur. Stop the engine by turning the engine start switch to the OFF position.

h. After the engine starts, operate engine just above idle for 30 to 60 seconds before driving vehicle. Check the readings on the gages before moving vehicle. Return engine speed to idle before moving the range select control.

2-8. MOVING THE FORKLIFT



WARNING

- Do not travel with the automatic fork level switch in the ON position. It is possible to drop a load which could result in load damage, or injury or death to personnel.
- Use care when backing up. Have someone direct you if you cannot see where you are going. Watch clearances. Failure to do so can result in load damage, or injury or death to personnel.

CAUTION

The forks extend beyond the end of the carriage. The operator must be aware of the swing of forks when turning and allow for adequate clearance between forks and other objects.

a. Operating Safely.

(1) Do not allow riders on the vehicle.

(2) Understand vehicle's lifting limitations and keep vehicle under control. DO NOT try to exceed vehicle limitations.

WARNING

Vehicle is less stable when traveling with the load in a raised position. If you must move vehicle with the load raised above the carry position (bottom of load at 24 inches above the ground, with boom fully retracted and forks fully tilted to rear):

- Avoid sharp turns and sudden starts/stops.
- Operate all controls smoothly.
- Move very slowly.
- Keep vehicle level.

Failure to follow these precautions could result in injury or death to personnel.

(3) Always carry the load low (bottom of load 24 inches above the ground) for maximum stability.

CAUTION

Make sure lower cab door is closed when operating vehicle. Vehicle wheels can contact the lower door if left open when 4-wheel or crab steering is in use.

(4) Always operate forklift with the lower cab door closed.

WARNING

- Before operating the boom, use care to ensure that boom does not come near overhead wires, power lines or structures. If boom contacts overhead power lines or structures, injury or death to personnel could result. If lines are near to your operating area, notify your supervisor prior to starting work.
- Do not raise or extend the boom unless the frame is level. Failure to comply could cause the load to drop or machine to tip, resulting in injury or death to personnel.

(5) Should contact with a power line occur, stay on vehicle until the boom is cleared or until current is turned off. Keep all personnel off vehicle. If you must leave vehicle, JUMP, DO NOT STEP OFF.

2-8. MOVING THE FORKLIFT (CONT)

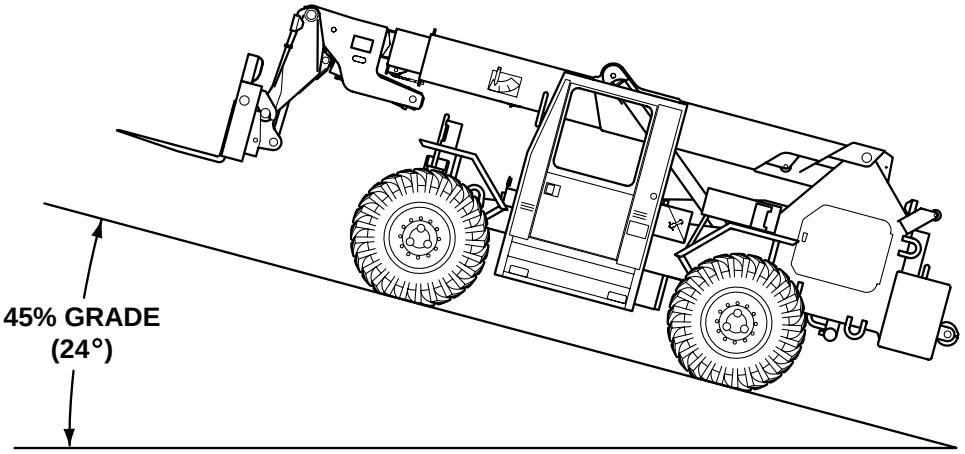
WARNING

Travel on inclines, slopes, ramps and grades only as follows:

- Loaded Forklift: with forks (and load) pointing uphill.
- Empty Forklift: with forks pointing downhill.

Failure to comply could result in operator injury or death.

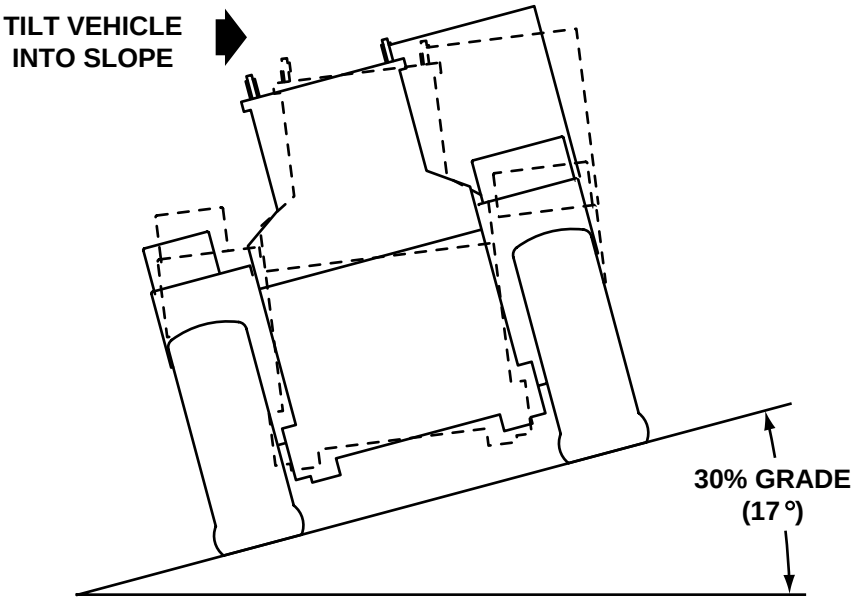
(6) Know your vehicle's operating limits for ascending, descending, and traversing slopes.



WARNING

Do not exceed 45% grade (24°) longitudinally. Vehicle becomes unstable as fluid levels are shifted. Internal components may not be properly lubricated causing vehicle damage. Tires may slip (loss of traction) or vehicle may tip, resulting in possible operator injury or death.

(a) With or without rated capacity load, for maximum longitudinal stability, do not exceed 45% grades (24°).



WARNING

Do not exceed 30% grade (17°) laterally. Vehicle becomes unstable as fluid levels are shifted. Internal components may not be properly lubricated causing vehicle damage. Tires may slip (loss of traction) or vehicle may tip, resulting in possible operator injury or death.

(b) With or without rated capacity load, for maximum lateral stability, do not exceed 30% grade (17°).

b. Starting Travel Procedures.

(1) With engine at idle speed, depress brake pedal to apply the service brakes.

(2) Make sure the travel select lever is in the Neutral, “N” position.

(3) Ensure that the forks are raised at least 24 inches above the ground.

(4) Move the range select lever to the desired gear ratio.

(5) Move the parking brake switch to OFF position.

(6) Move the travel select lever to the Forward, “F” position for forward travel, or down to the Reverse, “R” position for reverse travel.

(7) Release the brake pedal and depress the accelerator pedal to control vehicle speed.

2-8. MOVING THE FORKLIFT (CONT)

c. Changing Direction of Travel.

WARNING

DO NOT STOP QUICKLY. It is possible to drop a load which could result in load damage, or injury or death to personnel.

(1) Depress the brake pedal to apply service brakes and bring vehicle to a complete stop.

NOTE

When changing direction of travel, reduce engine speed.

(2) Move the travel select lever through Neutral, “N” to the desired direction.

d. Changing Gear Ratios.

WARNING

Do not downshift at high speeds. Vehicle will slow suddenly which could result in load damage, or injury or death to personnel.

CAUTION

Operating vehicle in high gear with a heavy load will cause the torque converter to slip excessively and may cause transmission to overheat.

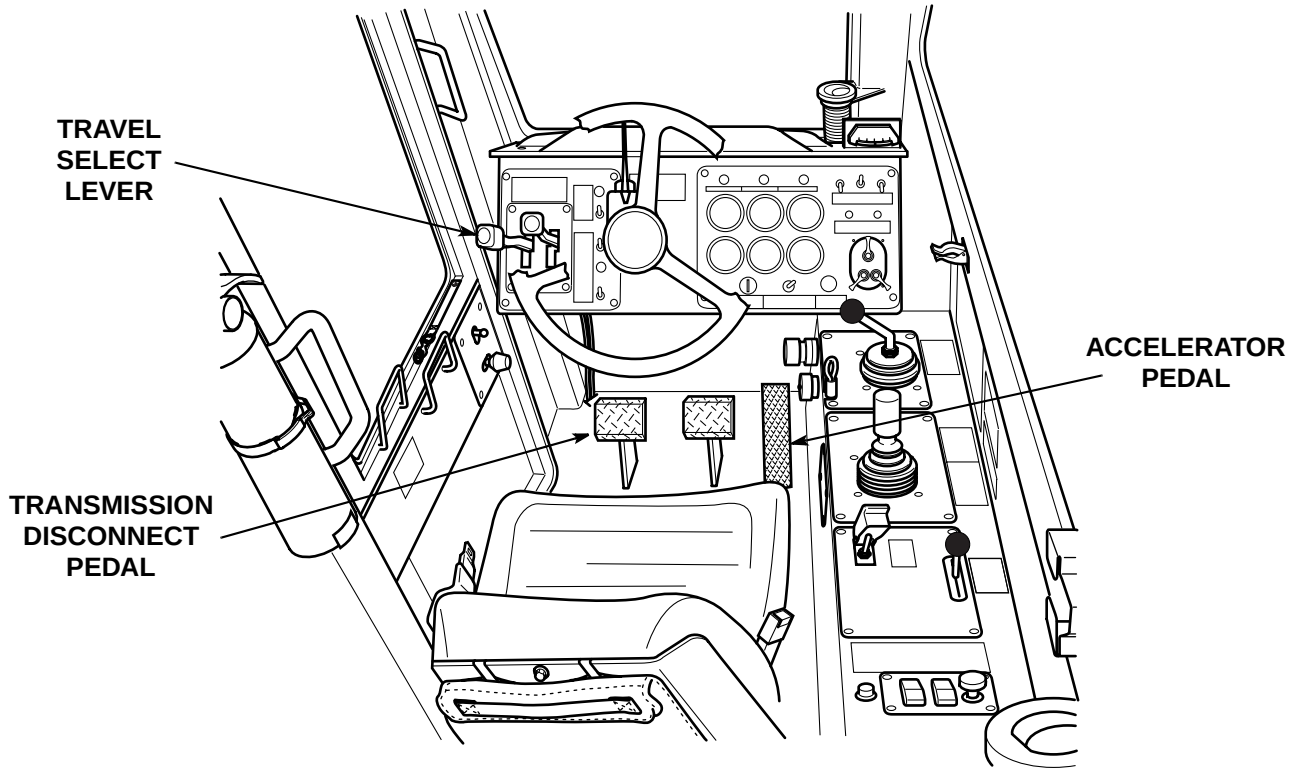
Upshifting and downshifting should be done in the normal sequence of speeds.

NOTE

Higher gears should be engaged only after reaching the top speed of the next lower gear. If necessary, vehicle should be slowed by means of the service brakes.

(1) Shifting to the next higher gear may be accomplished at any engine RPM while vehicle is in motion.

(2) When downshifting, DO NOT over-rev the engine. Allow vehicle to slow before shifting to the next lower gear.



e. Accelerating Hydraulic Functions. To accelerate operation of the hydraulic functions, use the following procedure:

(1) Depress and hold the transmission disconnect pedal.

(2) Depress the accelerator pedal to increase and maintain higher engine speed.

(3) Perform the desired hydraulic functions.

(4) Reduce engine speed to idle after operations are completed.

(5) Shift the travel select control lever as necessary.

(6) Slowly release the transmission disconnect pedal.

2-9. STEERING THE FORKLIFT

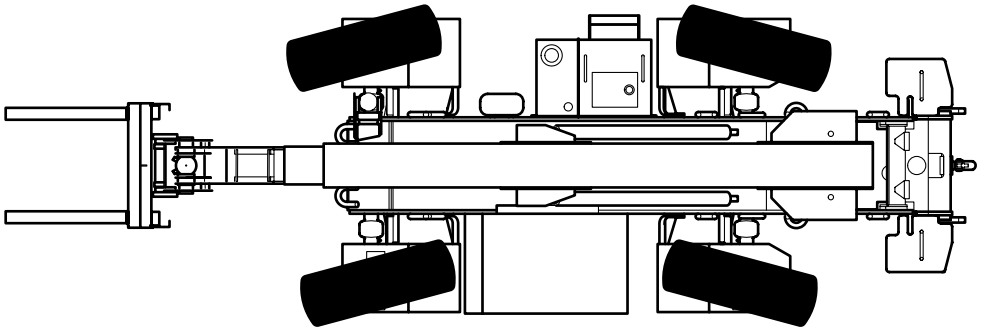
The forklift can be operated in three steering modes as selected with the steer select control switch: four wheel steer, two wheel steer, and crab steer.

WARNING

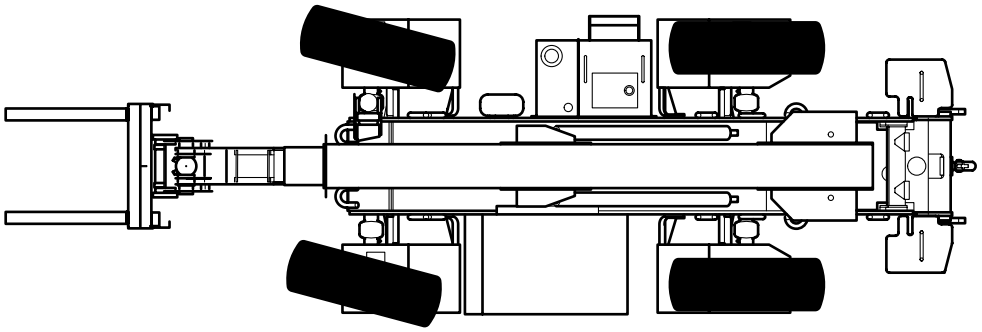
Do not turn fast. This may cause forklift to tip, lose the load, and possibly cause injury or death to personnel. This is particularly true in the four wheel steering mode. Turn vehicle in a lower gear or a slower speed.

CAUTION

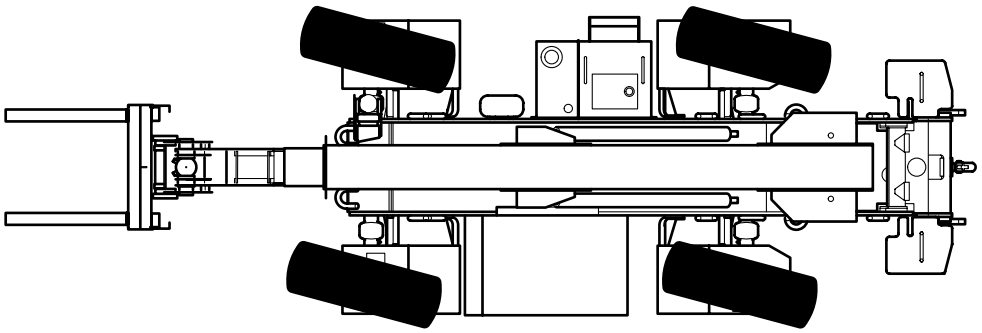
- Before changing steering modes, synchronize steering (refer to Para 2-9, d. Steering System Synchronization.). Failure to follow this caution will result in vehicle mistracking and tire damage.
- Forks extend beyond end of carriage. Be aware of swing of forks when turning. Allow for adequate clearance between forks and other objects.



a. Four Wheel Steering. Move the steer select control switch to the right position. Front wheels will steer in the direction that the steering wheel is turned; while the rear wheels will steer in the opposite direction. This mode allows an extremely short turn radius. It also enables the rear wheels to follow the tracking of the front wheels – an advantage in mud or sand conditions.



b. Two Wheel Steering. Move the steer select control switch to the center position. Front wheels will steer in the direction that the steering wheel is turned; while the rear wheels will remain in the fixed forward position. This mode is used for on-highway travel or at higher speeds.



c. Crab Steering. Move the steer select control switch to the left position. All wheels will steer in the same direction. This mode permits the operator to move vehicle sideways toward the landing point of the load. This is especially helpful in tight quarters on the job, where there is not enough space to move a conventional forklift back and forth several times in order to line up at the exact spot in front of the loading location.

d. Steering System Synchronization. Use the following procedures to align the front and rear wheels if wheels are not set in the same direction after you change steering modes (four wheel, two wheel, crab steer).

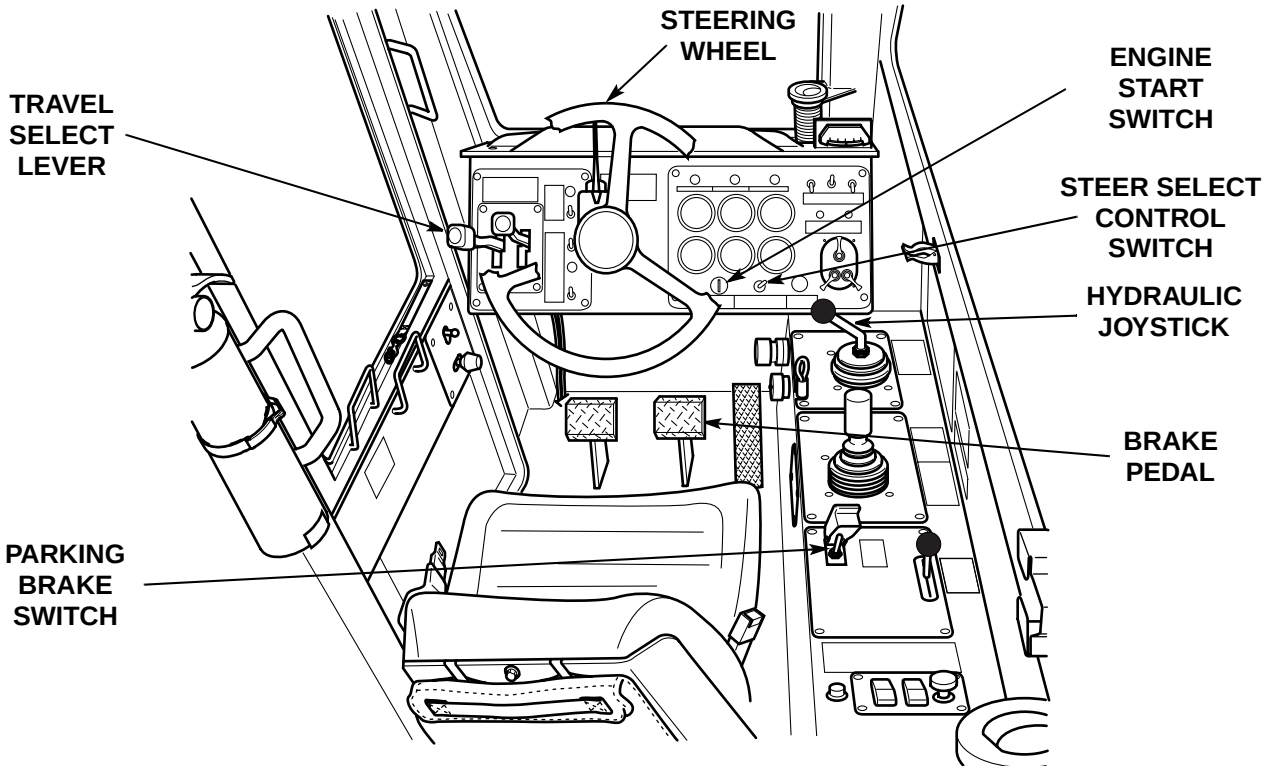
(1) Use the steering wheel to put rear wheels in a straight ahead position.

(2) Move the steer select control switch in the two wheel position (center).

(3) Use the steering wheel to adjust front wheels to a straight ahead position.

(4) Move the steer select control switch to desired mode for continued operation.

2-10. STOPPING THE FORKLIFT



a. Depress the brake pedal to slow vehicle down.

b. Bring vehicle to a complete stop. Move the travel select lever to the Neutral, “N” position.

c. Move the parking brake switch to the ON position.

d. Move the hydraulic joystick left to retract the boom extend cylinder.

e. Push the hydraulic joystick forward to lower the boom until forks are resting on the ground.

2-11. STOPPING THE ENGINE

a. Move the travel select lever to the Neutral, “N” position.

b. Move the parking brake switch to the ON position.

c. Move the hydraulic joystick control lever left to retract the boom extend cylinder.

d. Push the hydraulic joystick control lever forward to lower the boom until forks are resting on the ground.

e. Turn all lights and accessories off.

f. Allow the engine to idle for three minutes.

g. Turn the engine start switch to the OFF position.

h. Perform after operation checks listed in Preventive Maintenance Checks and Services (Section II).

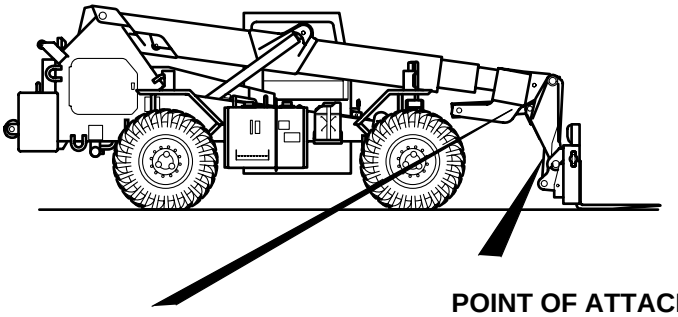
i. Lock the steering wheel with the steering wheel locking cable and lock.

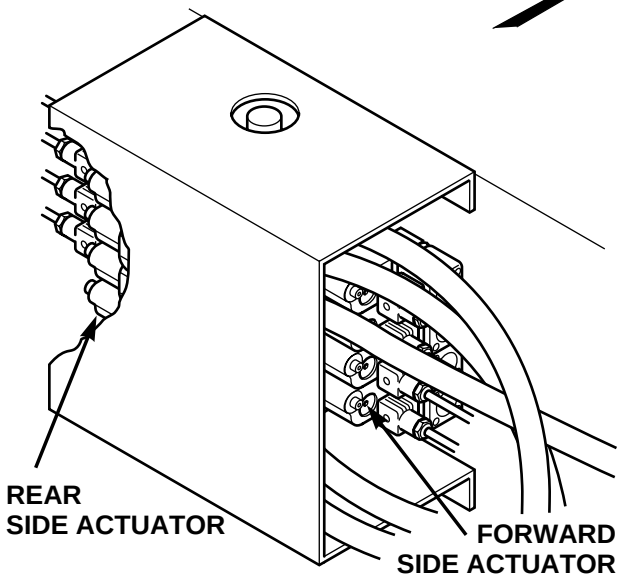
2-12. 6K/10K FORK CARRIAGE REMOVAL/INSTALLATION

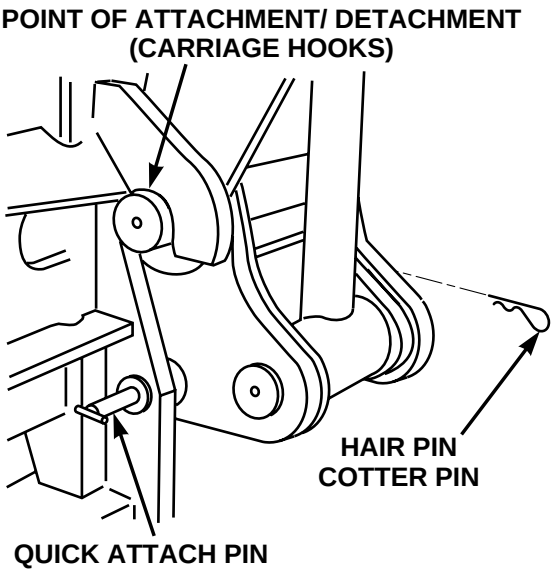
a. Removal.

NOTE

Ensure the forks of the carriage being removed are in a position other than fully shifted inboard or outboard to minimize trapped hydraulic pressure.







(1) Extend the ATLAS boom 5 - 10 ft. from front of the vehicle.

(2) Raise the attachment approximately 1 foot, level the 6K carriage and lower it to the ground.

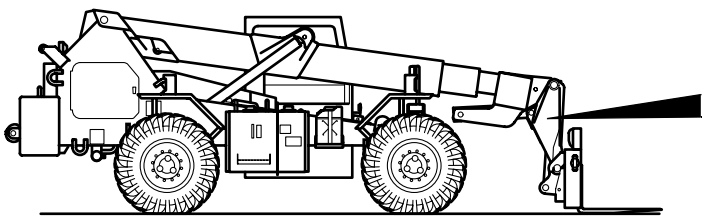
(3) Depress the manual actuators on the fork sideshift spools of the attachment valve. Actuate the forward side, followed by the rearward side. The fork sideshift spools are the lower two spools of the valve.

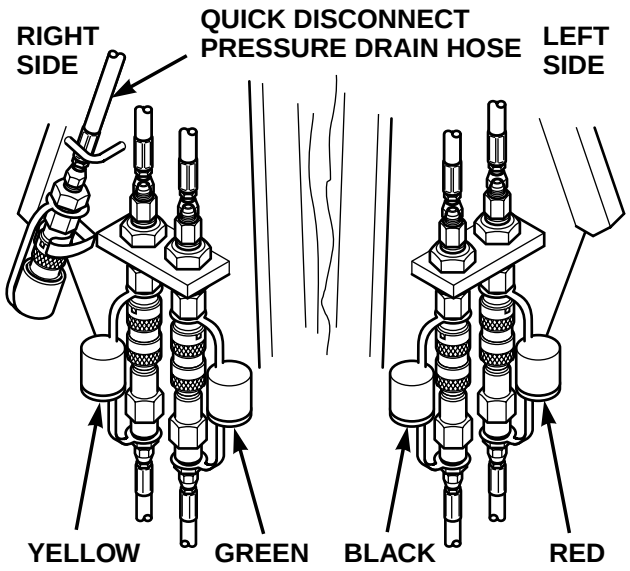
NOTE

- Care should be taken when handling the hoses during carriage interchange so as not to exert forces on the hoses which may tend to loosen the fitting(s) at the opposite end.
- Keep the engine running during the following steps but do not actuate the electric joystick with the fork sideshift button depressed.

(4) Disengage the hair pin cotter pin and remove the quick attach pin.

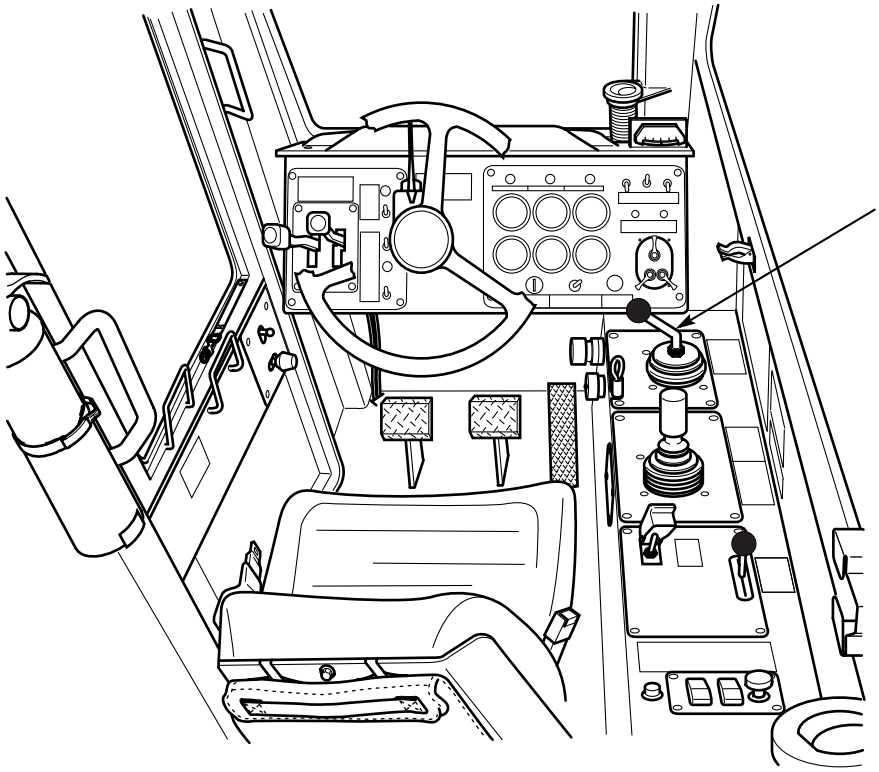
2-12. 6K/10K FORK CARRIAGE REMOVAL/INSTALLATION (CONT)





(5) Remove the four hydraulic hoses at the quick disconnects in the following sequence; red, black (left side), green, yellow (right side).

(6) Install rubber caps on four hydraulic hoses.



(7) Retract the carriage tilt cylinder (electric joystick, Fork Tip Lower).

WARNING

The 6K carriage weighs approximately 1,250 lbs. The 10K carriage weighs approximately 2,500 lbs. Keep out from underneath carriages. Failure to comply could result in injury or death to personnel.

(8) Lower the boom to disengage the carriage hooks. Retract the boom.

b. Installation.

(1) Maneuver the ATLAS so the 6K carriage is centered on the attachment.

(2) Retract the carriage tilt cylinder (electric joystick, Fork Tip Lower).

(3) Raise the attachment approximately 1 foot.

(4) Extend the ATLAS boom 5 - 10 ft. from front of the vehicle.

(5) Extend the boom to align the attachment with the quick attach hooks on the carriage.

WARNING

The 6K carriage weighs approximately 1,250 lbs. The 10K carriage weighs approximately 2,500 lbs. Keep out from underneath carriages. Failure to comply could result in injury or death to personnel.

(6) Raise the boom to engage the attachment with the carriage hooks.

(7) Raise the carriage tilt until the quick attach pin can be inserted through the carriage and the attachment.

(8) Insert the quick attach pin and hair pin cotter pin.

NOTE

If hydraulic pressure is too great to connect hydraulic hoses, perform step (10).

(9) Remove the rubber caps and connect the four hydraulic hoses at the quick disconnects in the following sequence: yellow, green (right side), black then red (left side).

(10) Remove rubber cap on quick disconnect pressure drain hose and connect each hydraulic hose to quick disconnect pressure drain hose to relieve hydraulic pressure.

2-13. ROADING THE 6K FORK CARRIAGE

NOTE

- Your ATLAS will arrive with its 6K carriage riding on the attached 10K carriage. You must remove and store the 6K carriage if the 10K is to be used. Or, if the 6K carriage will first be placed in service, you will remove the 6K, remove and store the 10K, and then reattach the 6K carriage to the ATLAS.
- The aid of an assistant will be required to perform this task, because proximity of the 6K and 10K carriages will be difficult to determine from inside the cab.

a. Removing the 6K Carriage from the 10K Carriage.

(1) Use the electronic joystick to move the right 10K fork to the right just enough for the back of the right fork to clear the weldment on the back of the 6K carriage. Move the left 10K fork to the left just enough for the back of the left fork to clear the other weldment.

2-13. ROADING THE 6K FORK CARRIAGE (CONT)

WARNING

The 6K carriage weighs approximately 1,250 lbs. Keep out from underneath 6K carriage. Failure to comply could result in injury or death to personnel.

(2) Ensure that the 6K carriage is positioned properly for storage.

(3) Lower the attachment and level the 10K carriage until the 6K carriage just rests on the ground.

(4) Back the ATLAS up until the 10K forks are clear of the unloaded 6K carriage.

b. Installing the 6K Carriage on the 10K Carriage.

(1) Ensure that the 6K forks are inboard of the holes for the 10K forks. If the 6K forks interfere, attach the 6K carriage, close fork gap and remount the 10K carriage.

(2) Maneuver the ATLAS so the 10K carriage is centered on the 6K carriage.

WARNING

The 6K carriage weighs approximately 1,250 lbs. Keep out from underneath 6K carriage. Failure to comply could result in injury or death to personnel.

(3) Lower the attachment, level the 10K carriage and lower it so the 10K forks are the same height from the ground as the holes in the 6K carriage intended for the 10K forks.

(4) Maneuver the ATLAS so the 10K forks go in the intended holes in the 6K carriage. The back of the 6K carriage must be resting against the 10K forks.

(5) Use the electronic joystick to move the right 10K fork to the left enough for the back of the right fork to rest tightly against the weldment on the back of the 6K carriage. Move the left 10K fork to the right enough for the back of the left fork to rest tightly against the other weldment.

(6) Raise the boom and 10K carriage into travel position. The 6K carriage can now be roaded.

2-14. COUNTERWEIGHTS REMOVAL/INSTALLATION

a. Removal.

WARNING

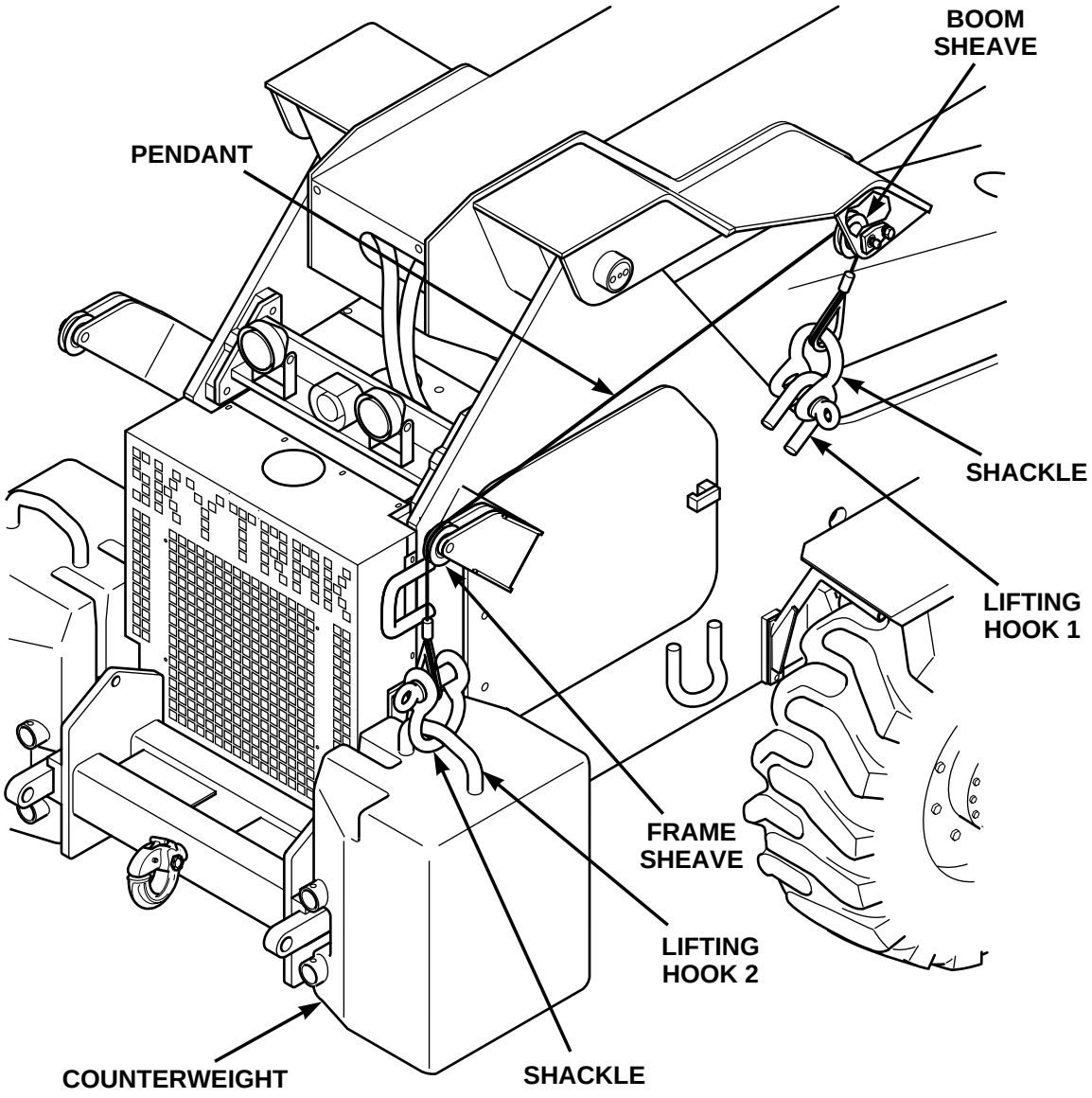
- Use only the pendants and shackles provided in the ATLAS tool box for counterweight removal and installation. Use of other lifting devices could result in injury or death to personnel.
- Do not use pendants if wires are frayed or broken. If one pendant is frayed or broken both pendants must be replaced. Failure to comply could result in injury or death to personnel.
- Counterweight assembly weighs 5,800 lbs. Keep out from underneath counterweight assembly. Failure to comply could result in injury or death to personnel.

(1) Park vehicle on level ground, and boom lowered and retracted.

(2) Remove two counterweight lifting pendants and shackles from the ATLAS toolbox.

(3) Attach the shackle that is connected to one end of the lifting pendant to lifting hook 1.

(4) Route the counterweight lifting pendant over boom sheave and frame sheave.



(5) Attach the shackle that is connected to the other end of the lifting pendant to lifting hook 2.

(6) Repeat Steps (3) through (5) above for the other counterweight.

CAUTION

Ensure pendants stay routed properly over boom and frame sheaves throughout this procedure, or damage to equipment could result.

(7) While assistant observes, operator slowly and carefully raises boom just enough to take out the slack in the pendants.

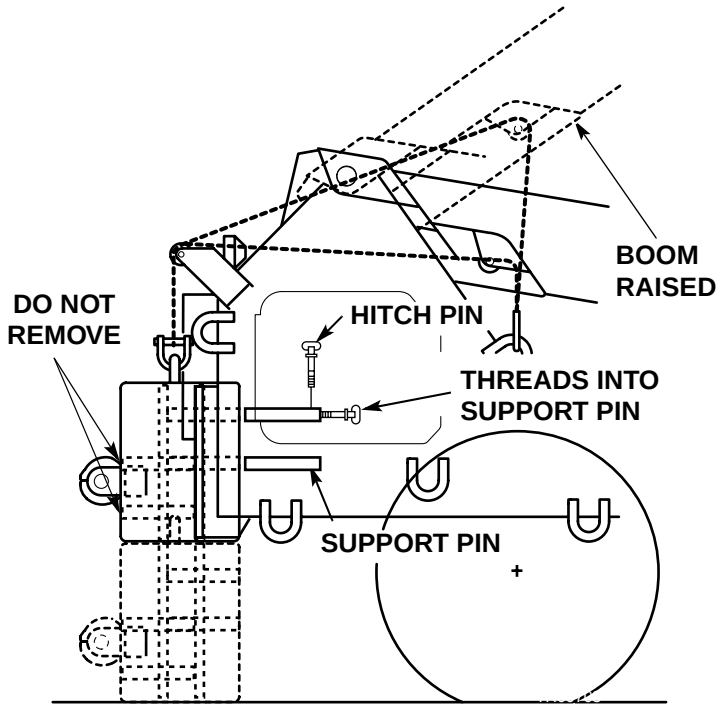
(8) Operator continues to raise the boom until the weight of the counterweights is supported by the pendants, not the counterweight support pins.

2-14. COUNTERWEIGHTS REMOVAL/INSTALLATION (CONT)

WARNING

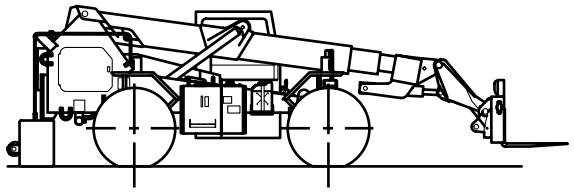
Counterweight assembly weighs 5,800 lbs. Keep out from underneath counter-weight assembly. Do not stick fingers or hands in holes for counterweight pins. Failure to comply could result in injury or death to personnel.

(9) When the weight of the counterweights is supported by the pendants, remove the four counterweight-to-frame support pins by removing each hitch pin, threading it in the end of the counterweight support pin, and then pulling the support pin out of the bore.



(10) Carefully lower the ATLAS boom to lower the counterweights to the ground.

(11) Remove the counterweight lifting pendants and shackles from the counterweights and vehicle frame.



b. Installation.

WARNING

Counterweight assembly weighs 5,800 lbs. Keep out from underneath counterweight assembly. Do not stick fingers or hands in holes for counterweight pins. Failure to comply could result in injury or death to personnel.

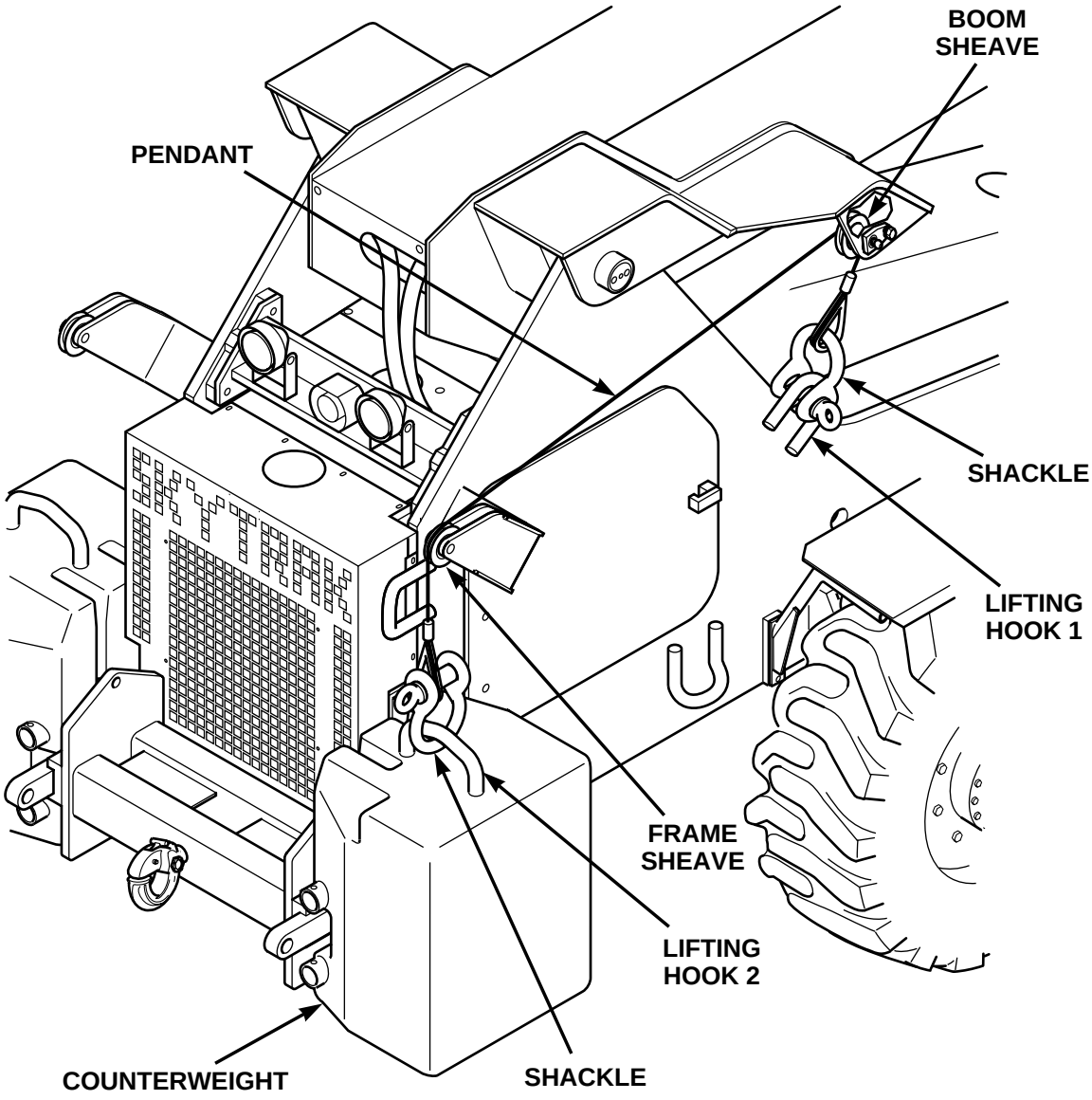
(1) Maneuver the ATLAS so rear of vehicle is centered on the counterweight assembly. Lower and retract boom.

(2) Attach the shackle that is connected to one end of the lifting pendant to lifting hook 1.

(3) Route the counterweight lifting pendant over boom sheave and frame sheave.

(4) Attach the shackle that is connected to the other end of the lifting pendant to lifting hook 2.

(5) Repeat Steps (2) through (4) above for the other counterweight.



WARNING

While counterweight is being raised, ensure the vertical frame mounting plates on the vehicle align with the slots in the counterweights. Do not allow the top of either counterweight to catch or bind on either hanger plate.

CAUTION

Ensure pendants stay routed properly over boom and frame sheaves throughout this procedure, or damage to equipment could result.

(6) While assistant observes, operator slowly and carefully raises boom until the counterweights are lifted into position. While operator raises the counterweights, assistant ensures frame mounting plates align with the grooves in the counterweights.

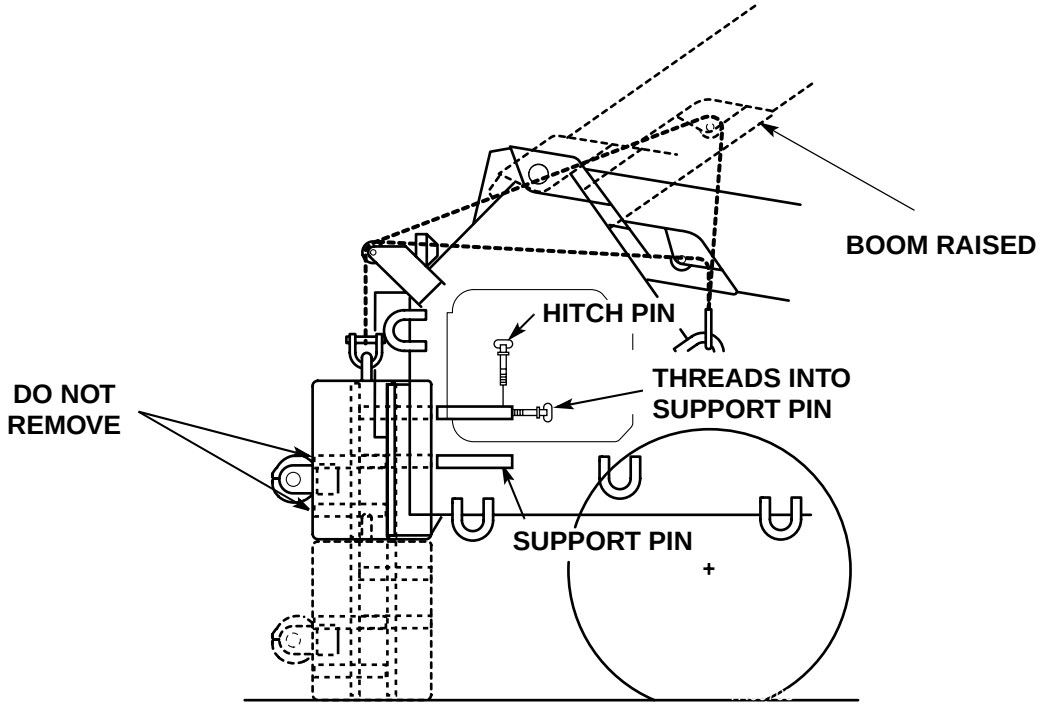
2-14. COUNTERWEIGHTS REMOVAL/INSTALLATION (CONT)

WARNING

Do not raise the boom beyond the point at which the pendants become taut with counterweights pinned to the frame. Failure to comply could result in injury or death to personnel.

(7) Operator continues to raise the boom until the four counterweight-to-frame support pins can be fully inserted in bores.

(8) Install the four counterweight-to-frame support pins in bores and secure with hitch pins.



(9) While assistant observes, operator slowly and carefully lowers boom until there is slack in the pendants.

(10) When the weight of the counterweight assembly is supported by the support pins, remove two counterweight lifting pendants and shackles and store in the ATLAS toolbox.

2-15. HIGHWAY TRANSPORT

a. General.

(1) The ATLAS is highway transportable with a minimum of restrictions. However, because of its 100.2 inch width, the ATLAS exceeds the maximum legal limit of 96 inches for most state's noninterstate highways. Permit requirements will vary depending upon local regulations and conditions, but in general the shipper must:

(a) Submit DD Form 1266 to the installation transportation officer (ITO) 2 weeks before the planned movement.

(b) Be aware that travel may be restricted to daylight hours on normal workdays.

(c) Be prepared to use "wide load" signs, amber lights, and escorts.

(d) Determine if blanket permits are available for specific prime movers, such as a heavy equipment transporter.

(2) With maximum road speed of about 23 mph, the ATLAS can move over highways for short distances under its own power. With the powertrain disconnected, it can be towed (see Para 2-31.)

(3) Refer to Appendix F for additional transportability information.

b. Prime Mover Selection.

(1) The physical size and weight of the ATLAS allow highway transport of the ATLAS by a variety of vehicles. In selecting a transporter, the proposed route and local availability of wide load permits must be considered. Table 1-2 presents a comparison of military semitrailers.

Table 1-2. Evaluation of Prime Movers

Semitrailers	Load rating (tons)	Comments
M747 HET	60	Much too large.
M870 Lowbed	40	Larger than needed, but usable.
M872 Flatbed	34	Not well-suited. Larger than needed, but usable. Deck height is 58 inches.
M172A1 Lowbed	25	Best. Deck is 115 inches wide and 40 inches high.
M871 Flatbed	22.5	Usable. Deck is 96 inches wide and 55 inches high. Slight over-hang of approximately 2 inches per side.
M127A2C Stake	12	Not well-suited. Deck height is 57 inches. ATLAS counterweight must be removed and shipped separately.
M345	10	Payload too small.

(2) When properly loaded on an M172A or M871, the ATLAS will not overload the transporter or exceed axle limits in most geographic areas.

2-15. HIGHWAY TRANSPORT (CONT)

c. Preparation. Preparation for highway transport includes:

(1) Filling fuel tank (or defueling) to one-quarter of its capacity.

(2) Removing all trash from the ATLAS.

(3) Performing all PMCS and ensuring any defects are repaired.

(4) Disconnecting the ether canister used for cold engine starting.

(5) If required, removing the 5,800 lb. counterweight to reduce the total weight of the ATLAS (see Para 2-14).

d. Loading Procedures.

(1) *Materials.* Table 1-3 shows the bill of materials for blocking and tiedown on a flatbed trailer.

Table 1-3. Bill of Materials of Transport by Semitrailer

Item	Quantity	Description
Chain	12	1/2 inch chain, 13, 750 pound minimum working load.
Load binders	12	Heavy-duty, double grabhook, Type 4, 3/8 to 1/2 inch (26,000 pound breaking strength) NSN 3990-01-213-1746

NOTE

- Chain assemblies and load binders are basic issue items (BII) for some trailers.
- Load binders are generally marked with an ultimate breaking strength rating. Depending on manufacturer, the breaking strength is about three times the safe working load.
- Chain is generally rated by proof test load, or about two times the safe working load.

(2) *Loading.*

(a) To place the ATLAS in the tiedown position on the semitrailer, use a crane of adequate capacity or drive the ATLAS onto a semitrailer if suitable ramp is available.

(b) Position ATLAS so its weight is distributed relatively equal over the tractor and trailer axles.

(c) Position the boom so that the carriage is 17 inches (432 mm) above the deck.

(d) Set the parking brake.

(e) Place the transmission in neutral.

(f) Turn engine OFF.

(3) *Tiedown.* See Appendix F for instructions on restraining the ATLAS against forces encountered at normal speeds and operating conditions.

2-16. RAIL TRANSPORT

a. General. The ATLAS is rail-transportable in CONUS and NATO countries without restriction on most general purpose, standard deck-height flatcars. The railcar may have a wood or steel deck and standard or cushioned-draft couplers. It must have suitable tiedown points, such as stake pockets or chain-tiedown anchor channels. (Contact MTMCTEA for a pamphlet on rail loading: MTMCTEA Pamphlet 55-19, *Tiedown Handbook for Rail Movements.*)

b. Rail Loading.

(1) *Railcar Selection.* Because of its size and weight, the ATLAS is rail transportable by a variety of railcars. Table 1-4 presents features of commonly available military and commercial railcars.

Table 1-4. Evaluation of Rail Cars

Railcar	Features	Comments
DODX 140-ton	Steel deck, couplers are hydraulically cushioned, 1/2 inch chain-tiedown	Designed and intended for M1 Abrams and other tracked vehicles.
DODX 50-ton	Wood-deck, 1/2 inch chain-tiedown	Suitable
General-purpose Flatcar	Wood deck, couplers have stiff mechanical snubbers only.	Suitable, 5/8 inch cable and blocking required.
Trailer Train: HTTX	Wood deck, couplers are hydraulically cushioned, 1/2 inch chain-tiedown	Suitable
OTTX	Wood deck, couplers are hydraulically cushioned, 3/8 inch chain-tiedown	Suitable
ITTX, TTDX	Steel deck, couplers are hydraulically cushioned, 1/2 inch chain-tiedown	Suitable

(2) *Preparation.* Preparation for rail movement includes:

(a) Filling fuel tank (or defueling) to one-quarter of its capacity.

(b) Removing all trash from the ATLAS.

(c) Performing all PMCS and ensuring any defects are repaired.

(d) Disconnecting the ether canister used for cold engine starting.

(e) If required, removing the 5,800 lb. counterweight to reduce the total weight of the ATLAS (see Para 2-14).

2-16. RAIL TRANSPORT (CONT)

(3) Loading Procedures.

(a) *Material.* When chain-tiedown cars are unavailable, the shipper must supply materials for blocking and tiedown on the railcar. Table 1-5 is a listing of such materials.

Table 1-5. Bill of Materials of Transport by Railcar

Item	Quantity	Description
Chain	8	1/2 inch chain, 13,750 pound minimum working load.
Load binders	12	Heavy-duty, double grabhook, Type 4, 3/8 to 1/2 inch (26,000 pound breaking strength) NSN 3990-01-213-1746

(b) *Loading.*

1 To place the ATLAS in the tiedown position on the railcar, use a crane of adequate capacity, or drive the ATLAS onto the railcar if a suitable ramp is available.

2 Position the ATLAS so that sufficient railcar tiedown points are available.

3 Position the boom so that the carriage is 17 inches (432 mm) above the deck.

4 Set the parking brake.

5 Place the transmission in neutral.

6 Turn engine OFF.

7 Band the upper portion of the operator's cab door shut.

(c) *Tiedown.* See Appendix F for instructions on restraining the ATLAS against forces encountered at normal speeds and operating conditions.

2-17. LOADING AND UNLOADING AMMUNITION AND OTHER PALLETS FROM A CONTAINER OR TRAILER

WARNING

- Use care when handling and transporting ammunition pallets. Failure to do so could result in injury or death to personnel.
- Never move any part of vehicle or load near a power line or overhead wires. Failure to follow this precaution could result in immediate injury or death to personnel.
- Ensure that counterweights are in place. An unbalanced vehicle could tip over and could cause injury or death to personnel.
- Always lift load from its resting spot before extending or retracting the boom. Always extend or retract the boom before lowering load to its resting spot. Failure to do so could cause vehicle instability and result in injury or death to personnel. Refer to Appendix E for Load Rating Chart.

a. Move vehicle to the pallet.

WARNING

Do not lift more than one pallet with forks. Pallets may topple and result in load or vehicle damage or injury or death to personnel.

b. Use the hydraulic joystick to position forks at bottom of uppermost pallet. Either manually or using the automatic fork level (auto fork level switch in ON position), level the forks and align the forks with the slots in the pallet.

c. Move vehicle or extend the boom to engage bottom of pallet with forks.

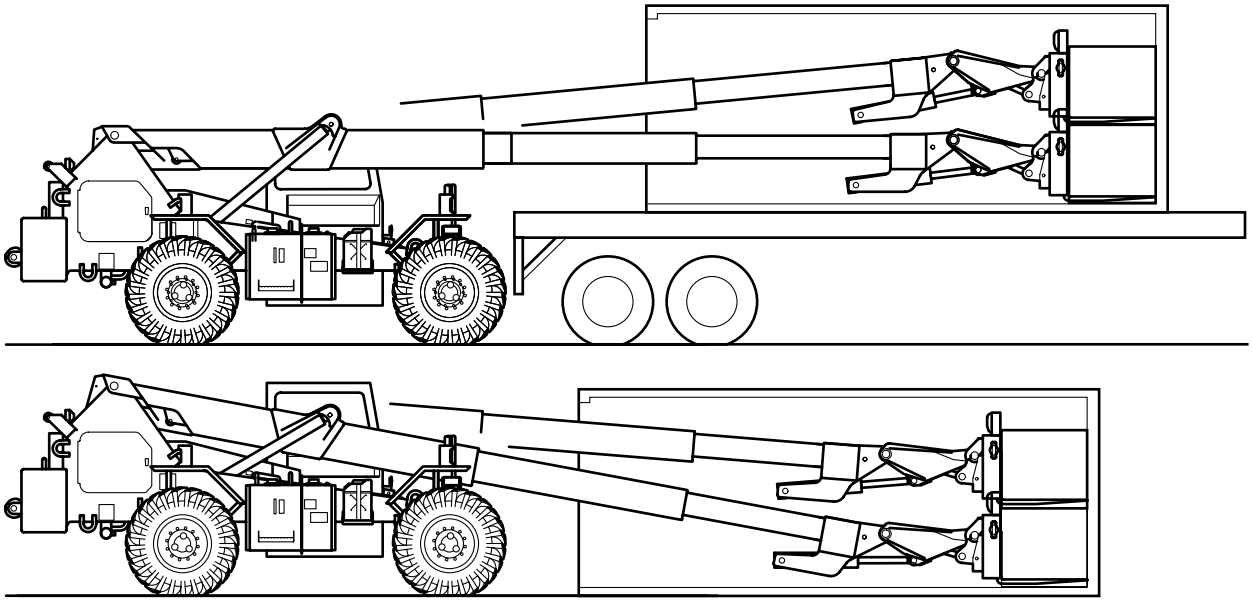
d. Use the hydraulic joystick to raise the boom and lift pallet slowly.

WARNING

Always retract the boom before lowering or transporting a load. Failure to do so could cause vehicle instability and result in injury or death to personnel.

e. Use the hydraulic joystick to retract the boom and then lower pallet to a travel position (approximately two feet above ground level).

2-17. LOADING AND UNLOADING AMMUNITION AND OTHER PALLETS FROM A CONTAINER OR TRAILER (CONT)



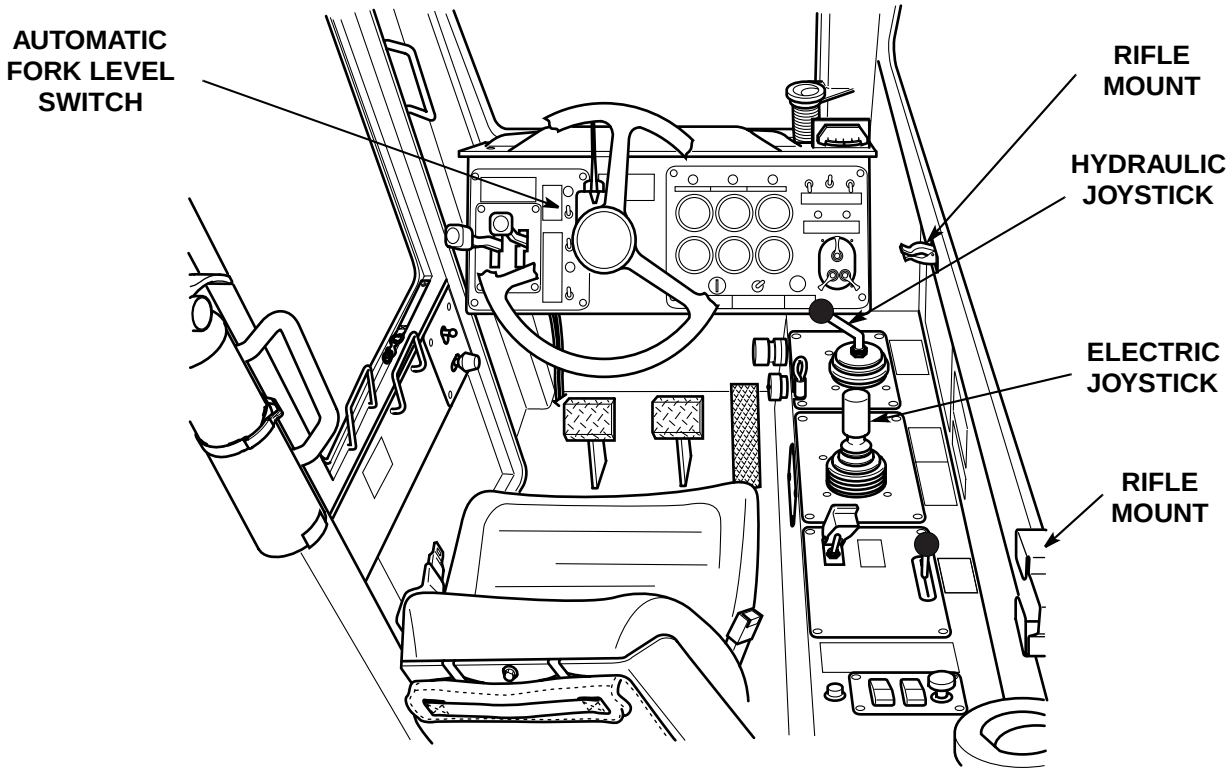
WARNING

Do not travel with the automatic fork level switch in the ON position. It is possible to drop a load which could cause load damage, or injury or death to personnel.

f. Move the automatic fork level switch to the OFF position before traveling.

g. Use the electric joystick to raise the fork tips and enable load to be supported by the carriage. Use care when traveling with a load.

h. Move vehicle to unloading area and in line with unloading area.



i. Move the automatic fork level switch to the ON position. Use the hydraulic and electric joysticks to set load down.

j. Move the automatic fork level switch to the OFF position and use the hydraulic and electric joysticks to remove the weight from forks. Move vehicle slowly away from pallet.

k. Use the electric joystick to move forks to a carrying position.

l. Repeat Steps a. through k. above for continued operation.

2-18. RIFLE MOUNT

a. Stow rifle in stowage mount.

(1) Position butt of M-16 rifle in rear mount with trigger guard toward top of vehicle.

(2) Position barrel of M-16 rifle in front mount toward front of cab.

(3) Check that M-16 rifle is held tightly.

2-18. RIFLE MOUNT (CONT)

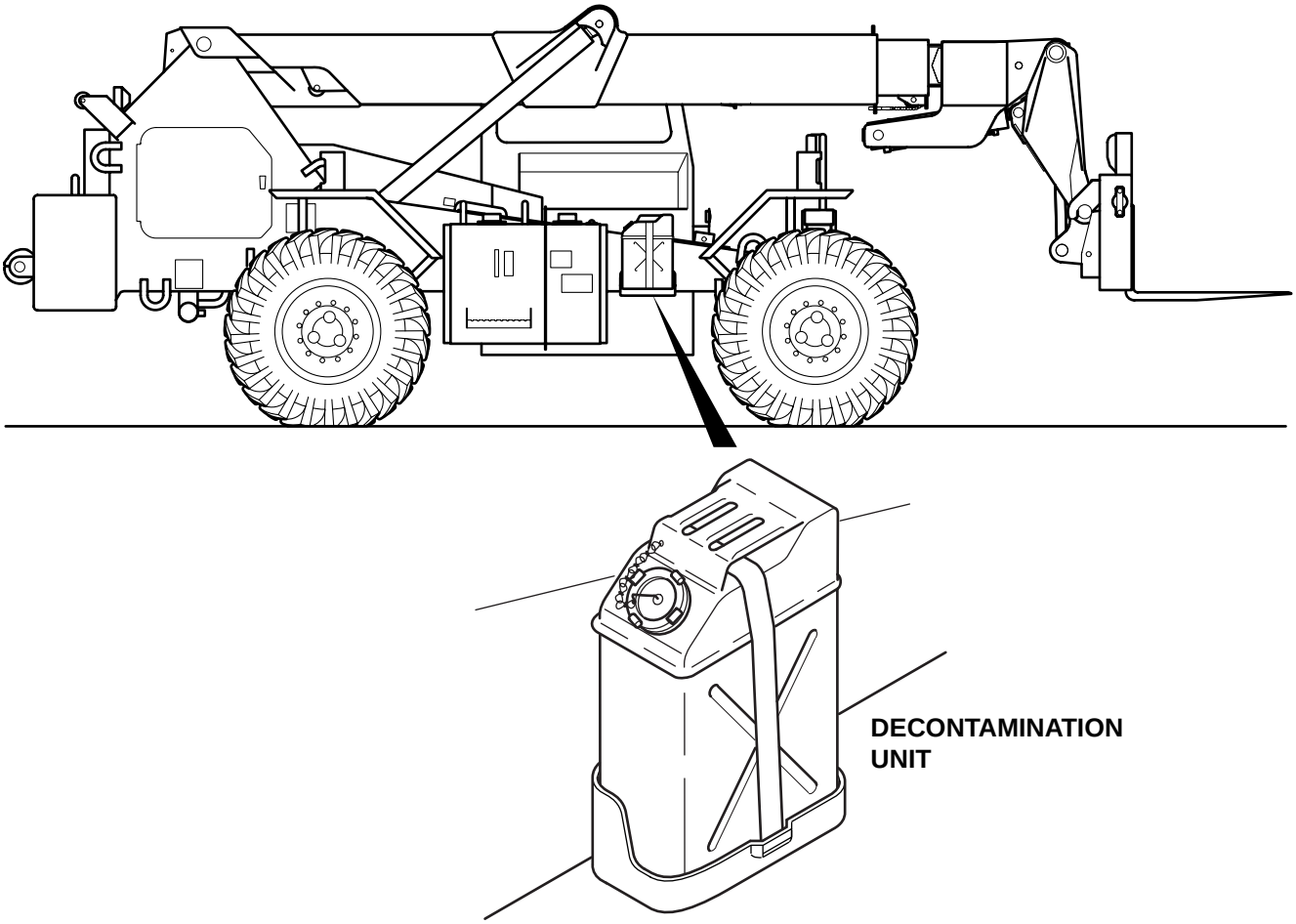
b. Remove rifle from stowage mount.

(1) Pull the handle of front mount up and toward top of cab.

(2) Remove the barrel of M-16 rifle from front mount.

(3) Remove the butt of M-16 rifle from rear mount.

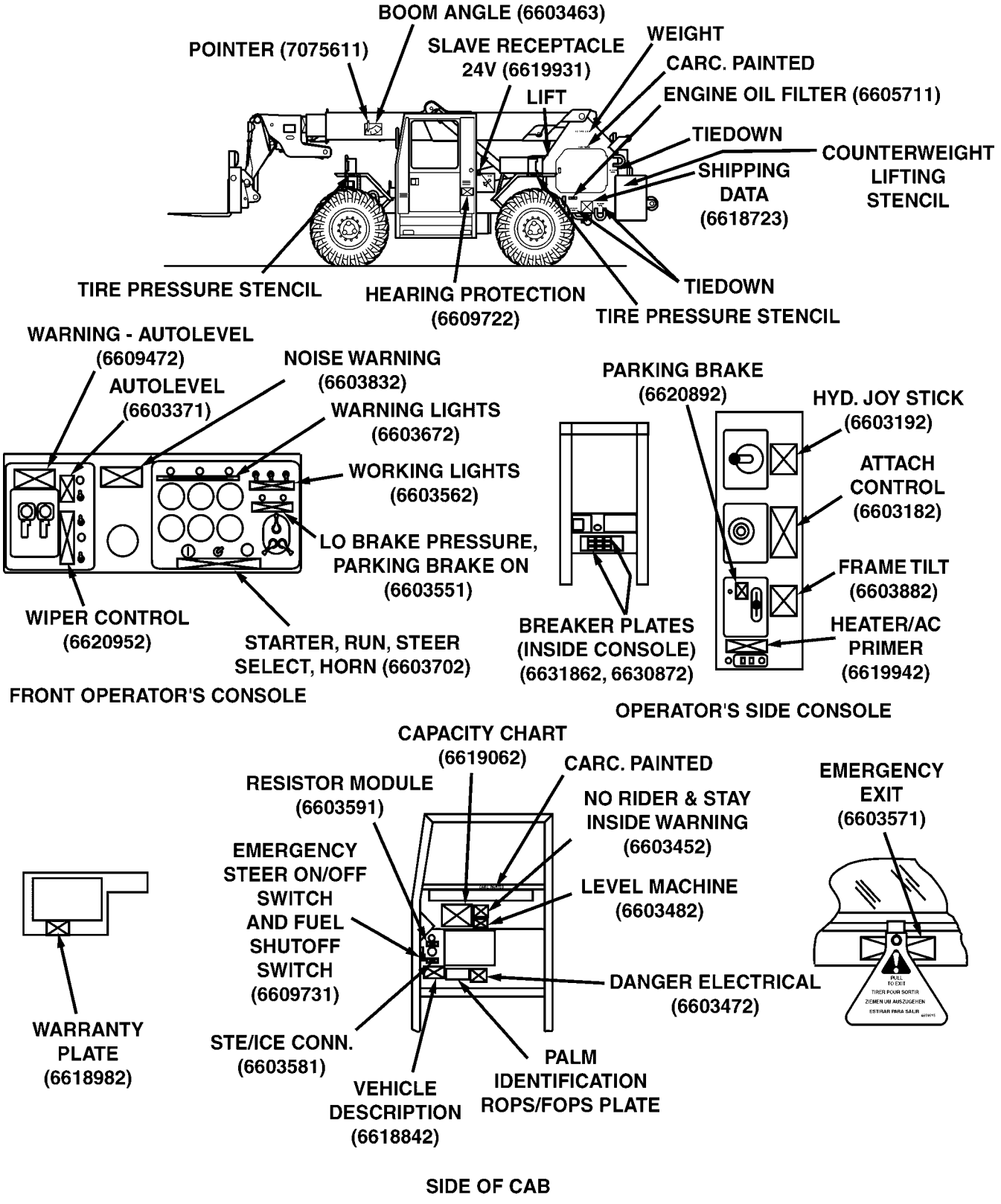
2-19. DECONTAMINATION UNIT



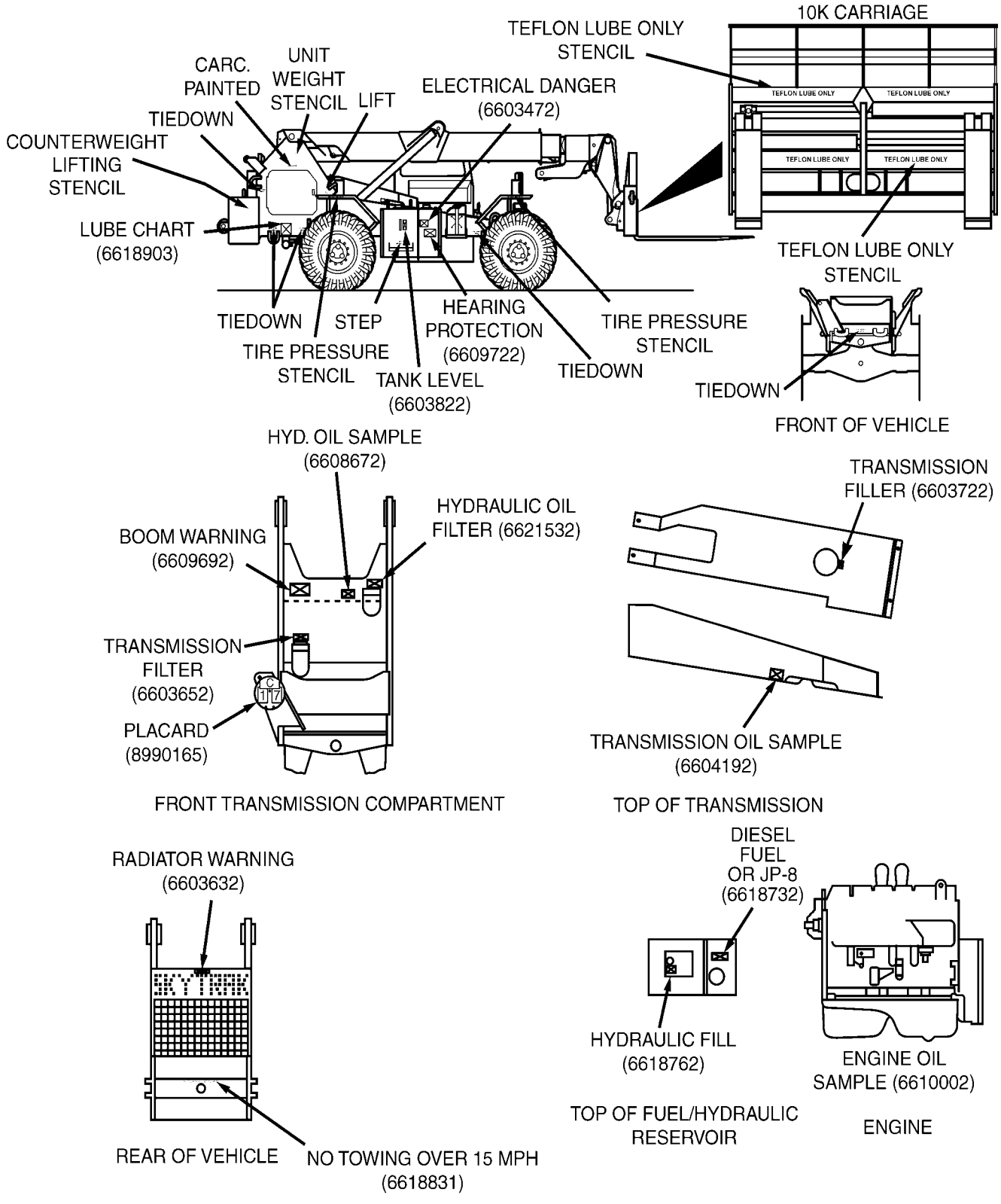
Refer to TM 3-4230-214-12&P for decontamination unit operating instructions.

2-20. DECALS AND WARNING PLATES

Refer to the next two figures for an illustration of the location of data plates, decals and warning plates.



2-20. DECALS AND WARNING PLATES (CONT)



Section IV. OPERATION UNDER UNUSUAL CONDITIONS

2-21. GENERAL

This section provides the operator with additional instructions for operating in various environments and emergency situations.

2-22. OPERATION IN EXTREME MOIST HEAT

At Halt or Parking.

(1) Park the ATLAS under shelter, if possible.

(2) Dry the seat and wiring to prevent the formation of mildew.

(3) Keep the fuel tank full at all times to avoid condensation forming in the tank.

(4) Contact Unit Maintenance to check all points of lubrication according to the PMCS.

2-23. OPERATION IN EXTREME DRY HEAT (REFER TO FM 90-3, DESERT OPERATIONS)

a. Preparation. Precautions must be taken to avoid overheating.

(1) Contact Unit Maintenance to drain, flush and refill cooling system.

(2) Contact Unit Maintenance to lubricate the ATLAS with correct grade of lubricants in accordance with the PMCS.

b. Operation.

WARNING

The cooling system operates under pressure which is controlled by the radiator cap. It is dangerous to remove the cap while system is hot because hot steaming gases will escape and burn you. Always allow system to cool, then turn the cap to the first stop and allow the pressure to escape before removing the cap completely.

(1) Check the water temperature gage at frequent intervals.

(2) Check the air cleaner indicator frequently. Have filter serviced often.

c. At Halt or Parking. Park the ATLAS in a shaded area, if possible.

2-24. OPERATION IN EXTREME COLD (TO –25° F)

CAUTION

- In severe cold, engine coolant and fluid in windshield washer can freeze, batteries can freeze and crack, oil and grease may get thick and stiff and rubber may crack or break easily.
- Watch instrument panel closely. If there are any unusual readings, stop vehicle and shut off engine. Check vehicle immediately.
- All ice and snow should be removed from vehicle immediately. Snow and ice may slow or stop movement of critical parts if allowed to pile up.

a. Preparations. Extensive preparation of mechanical equipment is required when extreme cold weather is anticipated. The following steps will help protect vehicle against subfreezing temperatures.

(1) Contact Unit Maintenance to prepare the cooling system by draining and then refilling with antifreeze appropriate for anticipated temperatures (refer to Appendix D and FM 4-367).

(2) Contact Unit Maintenance to change the engine lubricating oil to the grade called for in the PMCS for cold weather operation.

b. Starting Engine.

(1) Try starting engine using the procedure detailed in Para 2-7.

WARNING

Do not operate vehicle with the emergency steer switch in the OFF position. If engine power is lost, there will also be a loss of emergency steering capabilities. Failure to follow this precaution could result in injury or death to personnel.

CAUTION

Use the engine primer button only while cranking engine. Use only for starting a cold engine. Failure to follow this precaution could cause engine damage.

NOTE

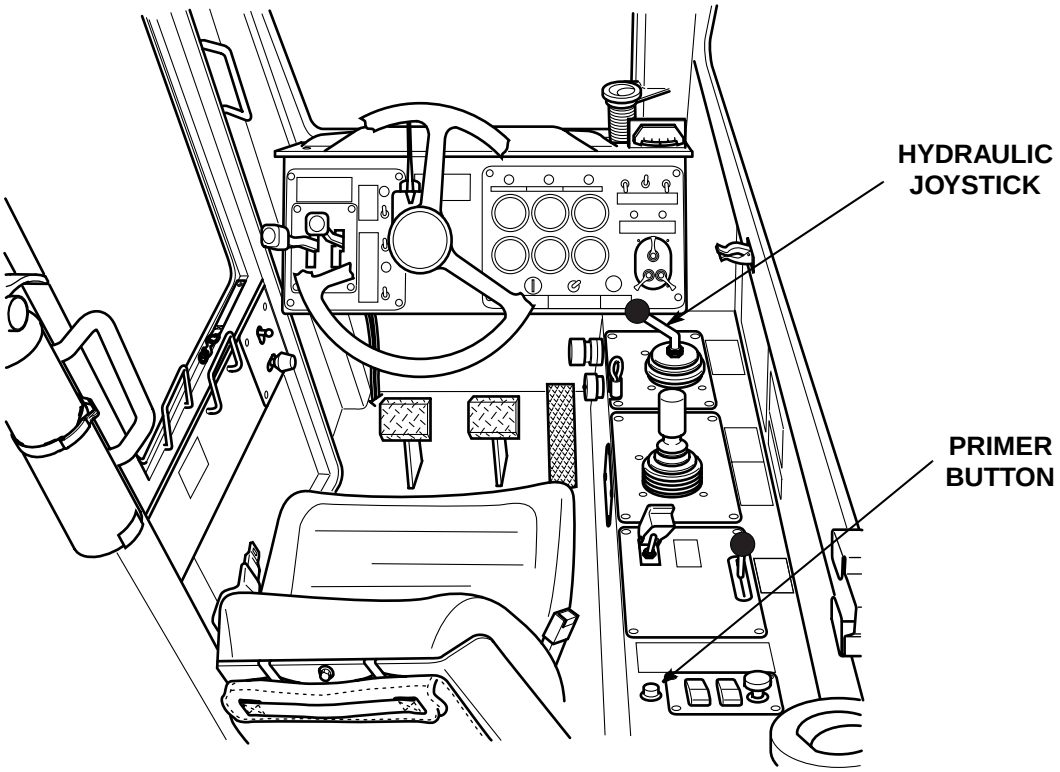
The engine primer will not function at temperatures above 34° F (± 8° F).

(2) If engine does not start, turn the emergency steering pump switch off (switch up).

CAUTION

Do not press the engine primer button for more than 5 seconds. Failure to follow this precaution could result in vehicle damage.

(3) Crank engine and press the engine primer button for no longer than 5 seconds.



(4) Release the engine primer button (this injects a measured amount of starting fluid into the engine).

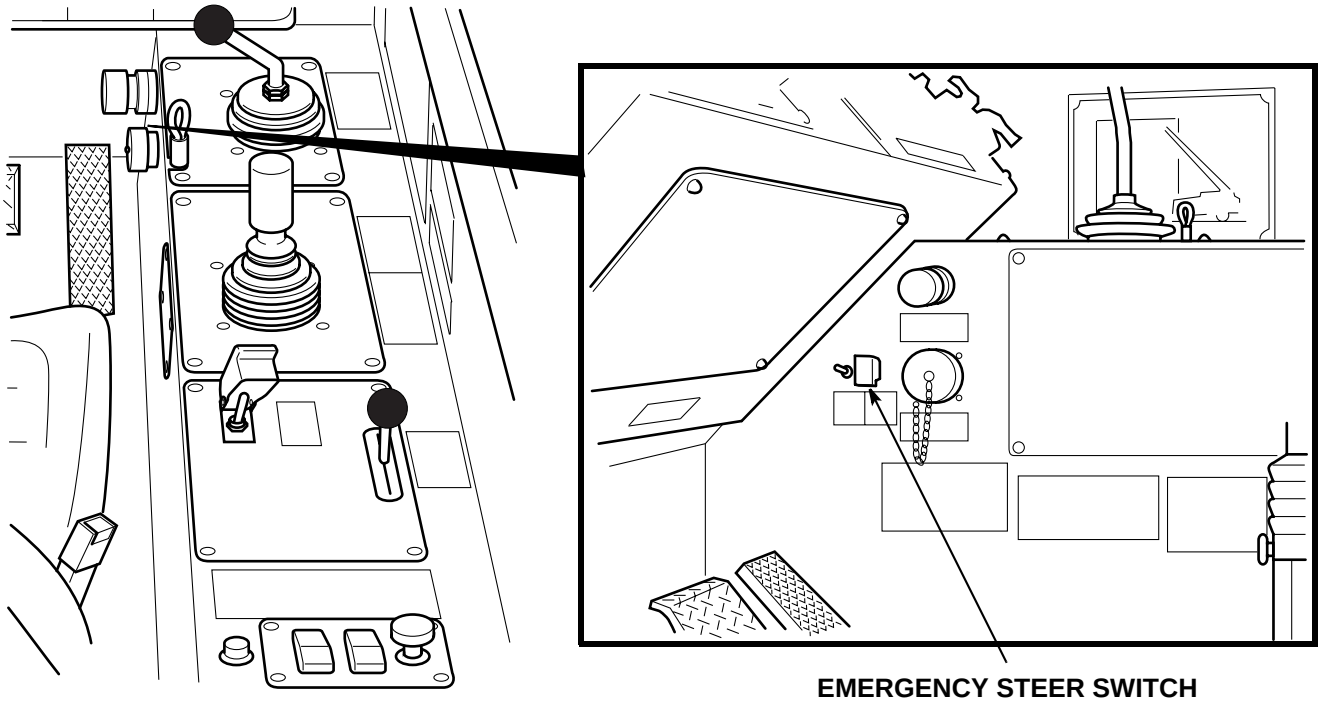
(5) If engine fails to start, repeat Steps (2) through (4) above. If engine fails to start after fourth repetition, notify Unit Maintenance.

(6) After starting the engine, run at half throttle until engine warms to normal temperature (180° – 190° F).

(7) Use the hydraulic joystick to raise the boom until forks are 6 inches from ground, and then fully retract the boom.

(8) Continue to hold the hydraulic joystick in the boom retract position for 10 to 15 minutes. This operation warms the hydraulic oil by forcing it through the boom circuit relief valve. Operate all hydraulic functions until warm oil has circulated through the cylinders.

2-24. OPERATION IN EXTREME COLD (TO –25° F) (CONT)



WARNING

Do not operate vehicle with the emergency steer switch in the OFF position. If engine power is lost, there will also be a loss of emergency steering capabilities. Failure to follow this precaution could result in injury or death to personnel.

NOTE

When moving the emergency steer switch to ON, the pump may operate for up to 10 seconds. If the pump runs longer than 10 seconds, oil is not warm enough. Move the switch to OFF. Repeat Step (8) above to allow hydraulic fluid to warm up before operating.

(9) Move the emergency steer switch to the ON position (red cover down) after the oil is warm and before driving vehicle.

2-25. OPERATION WITH ARCTIC KIT (TO –40° F)

CAUTION

- In severe cold, engine coolant, fluid in windshield washer can freeze, batteries can freeze and crack, oil and grease may get thick and stiff and rubber may crack or break easily.
- Watch instrument panel closely. If there are any unusual readings, stop vehicle and shut off engine. Check vehicle immediately.
- All ice and snow should be removed from vehicle immediately. Snow and ice may slow or stop movement of critical parts if allowed to pile up.

a. Preparations. Extensive preparation of mechanical equipment is required when extreme cold weather is anticipated. The following steps will help protect vehicle against subfreezing temperatures.

(1) Contact Unit Maintenance to prepare the cooling system by draining and then refilling with antifreeze appropriate for anticipated temperatures (refer to Appendix D and FM 4-367).

(2) Contact Unit Maintenance to change the engine lubricating oil to the grade called for in the PMCS for cold weather operation.

2-25. OPERATION WITH ARCTIC KIT (TO –40° F) (CONT)

b. Operating Arctic Heater.

WARNING

CARBON MONOXIDE (EXHAUST GAS) CAN KILL YOU.

Carbon monoxide is a colorless, odorless, DEADLY POISONOUS gas and when breathed deprives body of oxygen and causes SUFFOCATION. Breathing air with carbon monoxide produces symptoms of headache, dizziness, loss of muscular control, a sleepy feeling, and coma. Permanent BRAIN DAMAGE or DEATH can result from severe exposure.

The following precautions MUST be followed to ensure personnel are safe whenever arctic heater or engine is operated for any purpose. Otherwise, injury to personnel may result.

- DO NOT operate arctic heater or vehicle engine in enclosed area without adequate ventilation.
- BE ALERT at all times during vehicle operation for exhaust symptoms. If symptoms are present, IMMEDIATELY EVACUATE AND VENTILATE the area. Treat affected personnel as follows: expose to fresh air; keep warm; DO NOT PERMIT PHYSICAL EXERCISE; if necessary, give artificial respiration as described in FM 4-25.11 and get medical attention.
- BE AWARE; neither the gas particulate filter unit nor field protection mask for nuclear-biological-chemical protection will protect you from carbon monoxide poisoning.

THE BEST DEFENSE AGAINST CARBON MONOXIDE POISONING IS GOOD VENTILATION.

(1) To operate arctic heater:

(a) Ensure parking brake is applied.

(b) Ensure that coolant shut-off valve on left-side of engine is fully OPEN.

(c) Place emergency steer switch in OFF position.

(d) Place ignition switch in RUN position.

(e) Place switch on rear of arctic heater to ON (up) position.

(f) Allow arctic heater to operate for approximately 15 minutes, then place switch in OFF (down) position to shut off arctic heater.

(g) Place emergency steer switch in ON position.

(h) Start engine (see paragraph 2-25C).

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c. Starting Engine.

(1) Try starting engine using the procedure detailed in Para 2-7.

WARNING

Do not operate vehicle with the emergency steer switch in the OFF position. If engine power is lost, there will also be a loss of emergency steering capability. Failure to follow this precaution could result in injury or death to personnel.

CAUTION

Use the engine primer button only while cranking engine. Use only for starting a cold engine. Failure to follow this precaution could cause engine damage.

NOTE

The engine primer will not function at temperatures above 34° F (± 8° F).

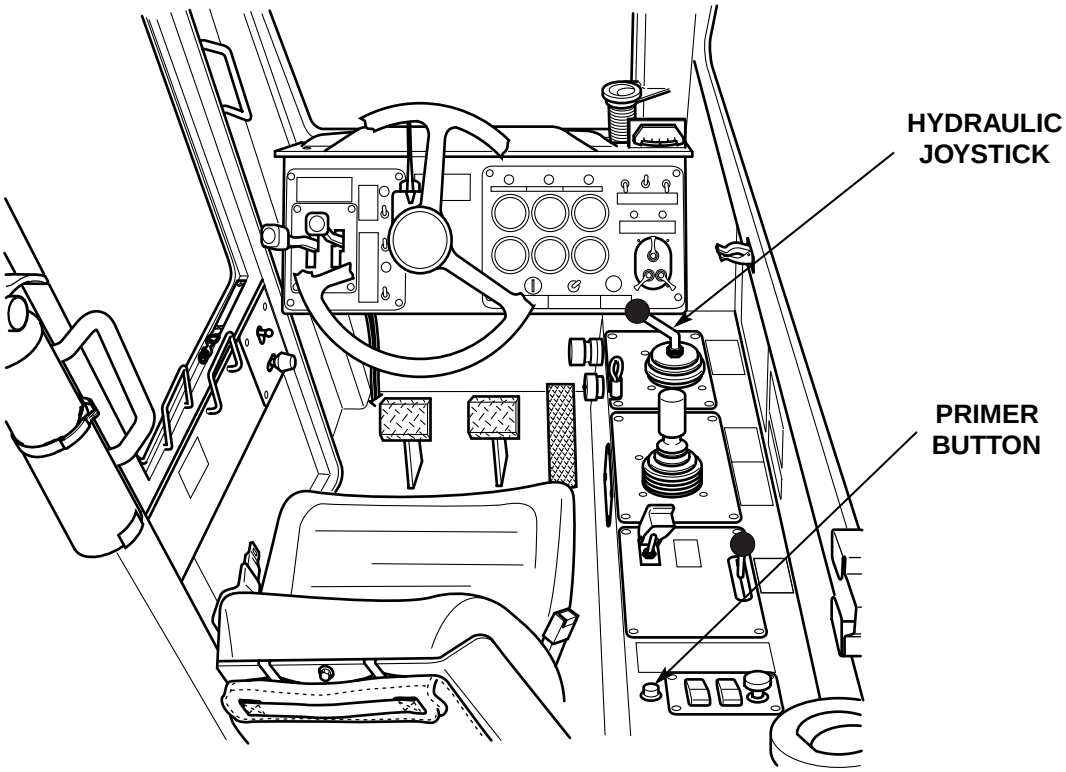
(2) If engine does not start, turn the emergency steering pump switch off (switch up).

CAUTION

Do not press the engine primer button for more than 5 seconds. Failure to follow this precaution could result in vehicle damage.

(3) Crank engine and press the engine primer button for no longer than 5 seconds.

2-25. OPERATION WITH ARCTIC KIT (TO –40° F) (CONT)



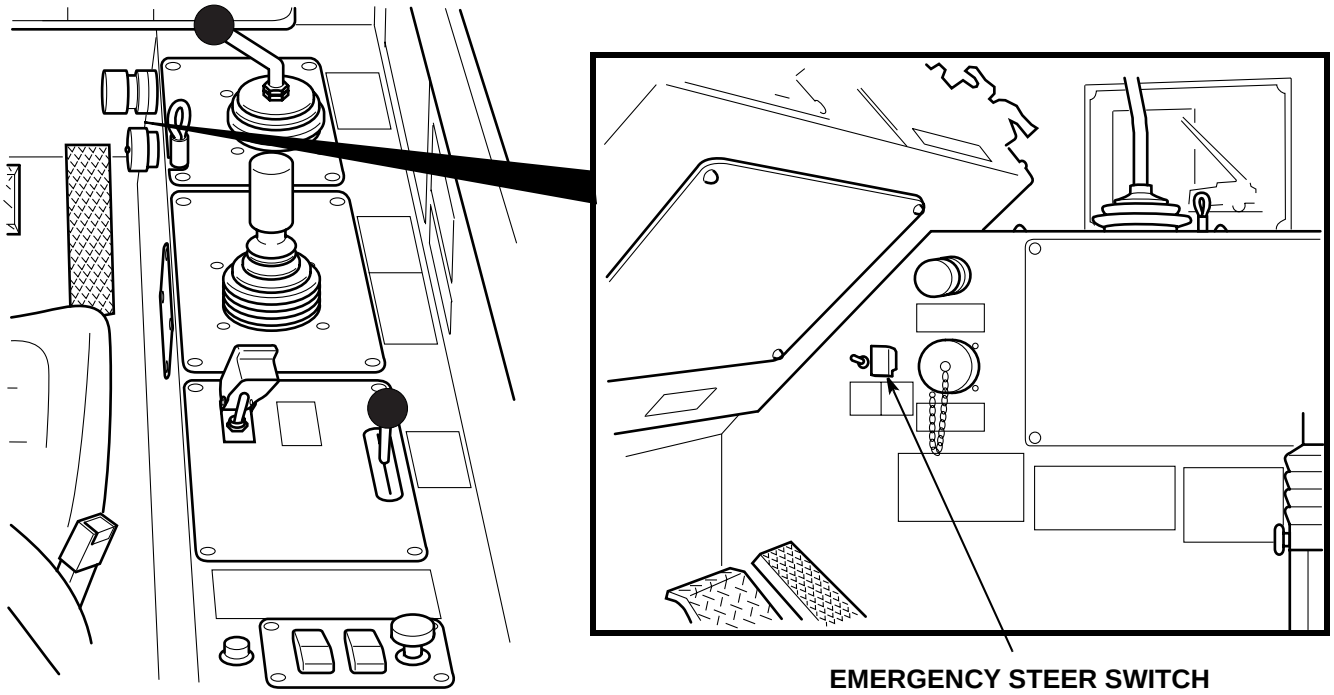
(4) Release the engine primer button (this injects a measured amount of starting fluid into the engine).

(5) If engine fails to start, repeat Steps (2) through (4) above. If engine fails to start after fourth repetition, notify Unit Maintenance.

(6) After starting the engine, run at half throttle until engine warms to normal temperature (180° – 190° F).

(7) Use the hydraulic joystick to raise the boom until forks are 6 inches from ground, and then fully retract the boom.

(8) Continue to hold the hydraulic joystick in the boom retract position for 10 to 15 minutes. This operation warms the hydraulic oil by forcing it through the boom circuit relief valve. Operate all hydraulic functions until warm oil has circulated through the cylinders.



EMERGENCY STEER SWITCH

WARNING

Do not operate vehicle with the emergency steer switch in the OFF position. If engine power is lost, there will also be a loss of emergency steering capability. Failure to follow this precaution could result in injury or death to personnel.

NOTE

When moving the emergency steer switch to ON, the pump may operate for up to 10 seconds. If the pump runs longer than 10 seconds, oil is not warm enough. Move the switch to OFF. Repeat Step (8) above to allow hydraulic fluid to warm up before operating.

(9) Move the emergency steer switch to the ON position (red cover down) after the oil is warm and before driving vehicle.

2-26. OPERATION IN SALT WATER AREAS

At Halt or Parking.

(1) In salt water area, keep the ATLAS as clean as possible. Salt water causes corrosion of exposed parts. After operation is completed, wash with fresh water, if available.

(2) Keep all lubricating points wiped clean and contact Unit Maintenance to lubricate as instructed in the PMCS.

(3) Keep all wiring and connections clean and free from corrosion.

2-27. OPERATION IN DUST OR SANDSTORMS

a. At Halt or Parking.

(1) Contact Unit Maintenance to lubricate the ATLAS at more frequent intervals. Clean all fittings and lubrication openings thoroughly before lubricating to prevent entrance of dust or sand with the lubricant.

(2) When not in use, cover the operator's compartment, and utilize whatever means are available to protect the engine compartment from the entry of windblown dust or sand.

b. Operation.

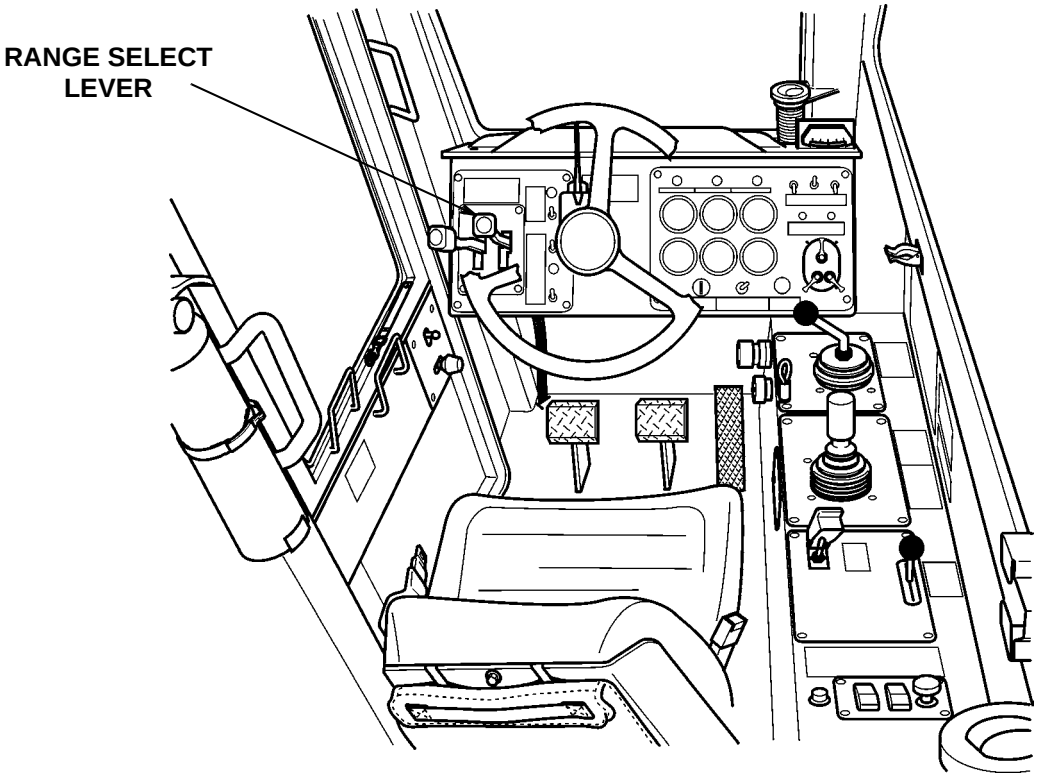
(1) Check the radiator frequently and keep it clean of dust and sand.

(2) Check the air cleaner indicator frequently. Service the filter as often as required.

2-28. FORDING

a. Check water depth, allowing for inconsistency of bottom. Do not attempt to ford even the narrowest stream that is more than 36 inches deep.

b. Make certain all gages are indicating normal operating pressure and temperatures.



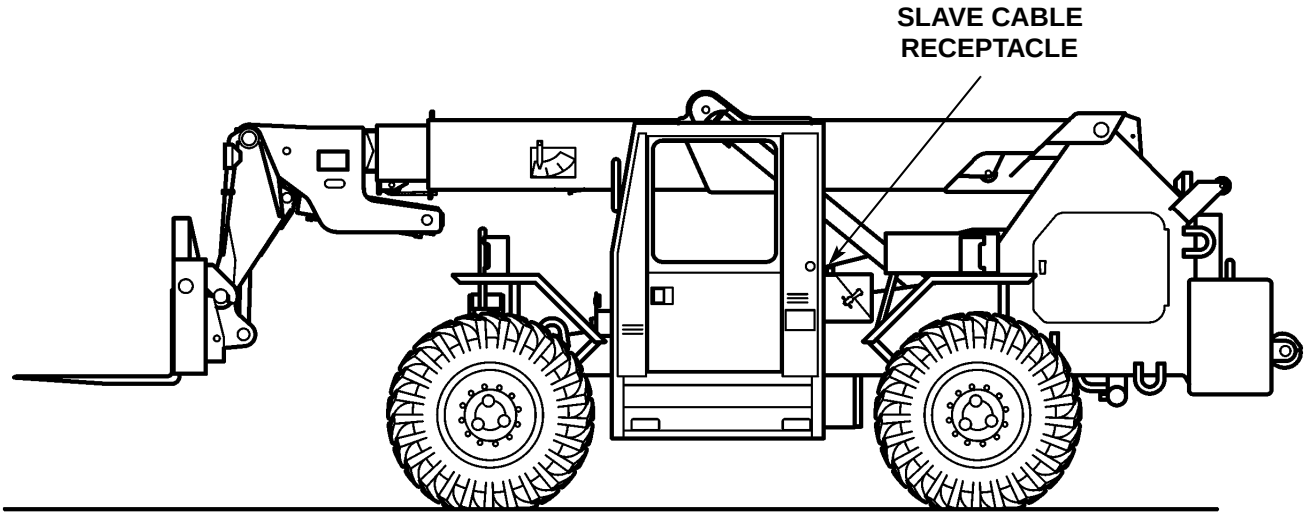
c. Use the range select lever to shift the transmission in the low speed range (position 1), and speed the engine up to minimize the danger of stalling. Enter the water slowly to minimize surges of backwash into the engine compartment. Fording speed should not exceed 3 to 4 miles per hour.

d. In the event of complete submersion, contact Unit Maintenance for appropriate disposition.

e. Contact Unit Maintenance to lubricate the ATLAS completely as soon as possible after fording.

2-29. SLAVE STARTING

The ATLAS is equipped with a 24 volt, negative ground electric system. The slave receptacle is located on top of the battery box. Ensure that both disabled and booster vehicles are equipped with a NATO slave receptacle.



a. Place emergency steering pump switch in OFF position.

a.1 Connect the slave cable to booster vehicle slave receptacle.

b. Connect other end of the slave cable to disabled vehicle slave receptacle.

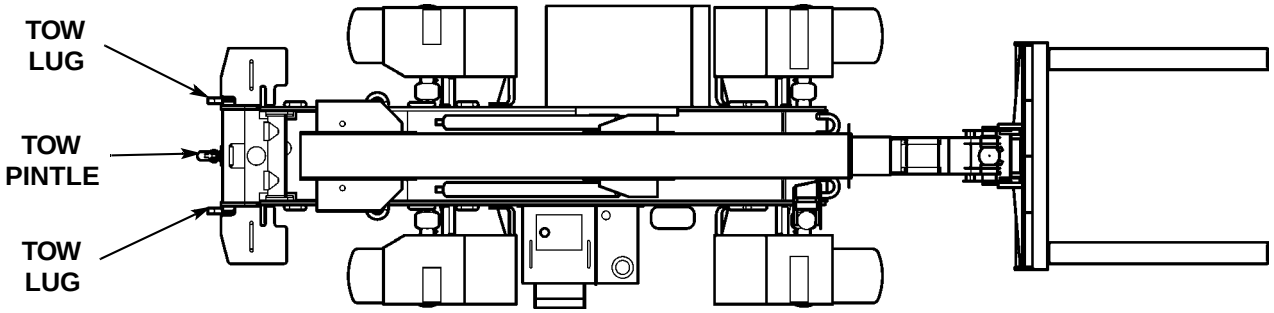
c. Run booster vehicle at a speed just above idle.

d. After starting disabled vehicle, return booster vehicle to idle.

e. Remove the slave cable from disabled vehicle, then from booster vehicle.

f. Return emergency steering pump switch to ON position.

2-30. TOWING OTHER VEHICLES



WARNING

- DO NOT TOW AT SPEEDS OVER 20 MPH.
- Carefully move vehicle into position. Always use a ground guide and any device necessary to lift the tow bar into position without standing directly between vehicles. Failure to comply could result in vehicle damage, or injury or death to personnel.
- The ATLAS is equipped with a towing pintle and lugs. Towing should be limited to vehicles weighing 33,500 pounds or less. Whenever the ATLAS is used to tow another vehicle, use the tow pintle to attach the tow bar.

2-31. TOWING THE ATLAS

Although unusual, a vehicle may experience an electrical, mechanical or hydraulic system failure. A vehicle may also be damaged to an extent that the mission cannot be completed normally. Effort must be given to repair the vehicle either at the current location or the vehicle driven to a repair facility. If vehicle cannot be safely driven, vehicle must be transported or towed.

Contact Unit Maintenance to perform necessary preparation of the ATLAS for towing.

WARNING

- If the ATLAS must be towed, the tow lugs are used to connect the tow bar.
- Carefully move towing vehicle into position. Always use a ground guide and any device necessary to lift the tow bar into position without standing directly between vehicles. Failure to comply could result in vehicle damage, or injury or death to personnel.
- DO NOT TOW AT SPEEDS OVER 20 MPH (32 KPH).

NOTE

If vehicle engine is not operational, perform Emergency Boom Operations (see paragraph 2-32) to retract and lower boom.

a. Fully retract boom.

b. Position forks approximately 24 in. (610 mm) above ground.

WARNING

When the propeller shafts are disconnected and the parking brake is released, vehicle may roll, resulting in injury or death to personnel. Always chock wheels securely.

c. Chock all four wheels and place parking brake switch in OFF position.

d. Shift transmission into NEUTRAL and turn engine start switch to OFF position to stop engine.

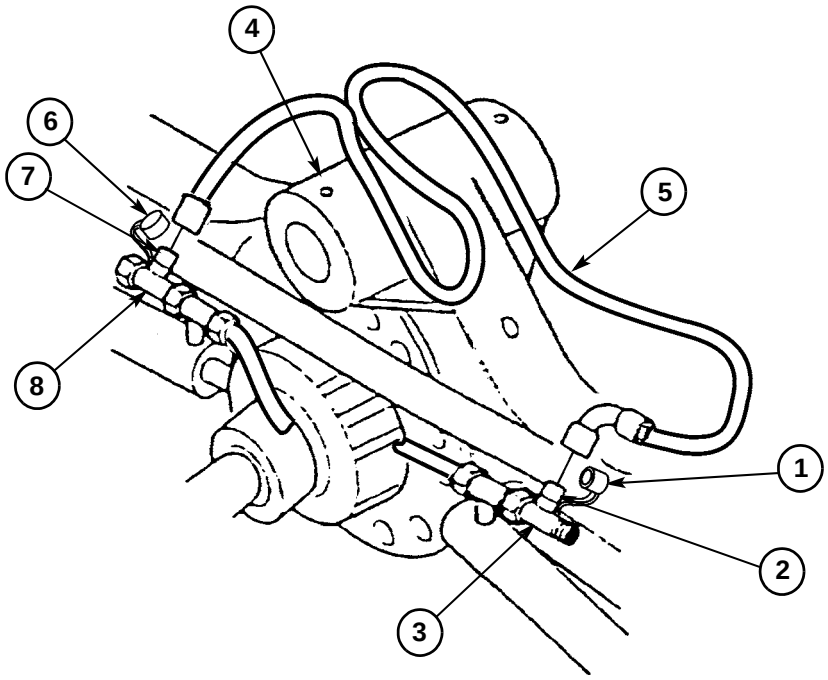
d.1. Remove dust cap (1) from diagnostic nipple (2) on tee (3) at left side of rear axle (4).

d.2. Connect either end of quick-connect hose (5) (BII) to diagnostic nipple (2).

d.3. Route quick-connect hose (5) up over axle pivot to right side of rear axle (4).

d.4. Remove dust cap (6) from diagnostic nipple (7) on tee (8) at right side of rear axle (4).

d.5. Connect other end of quick-connect hose (5) to diagnostic nipple (7).



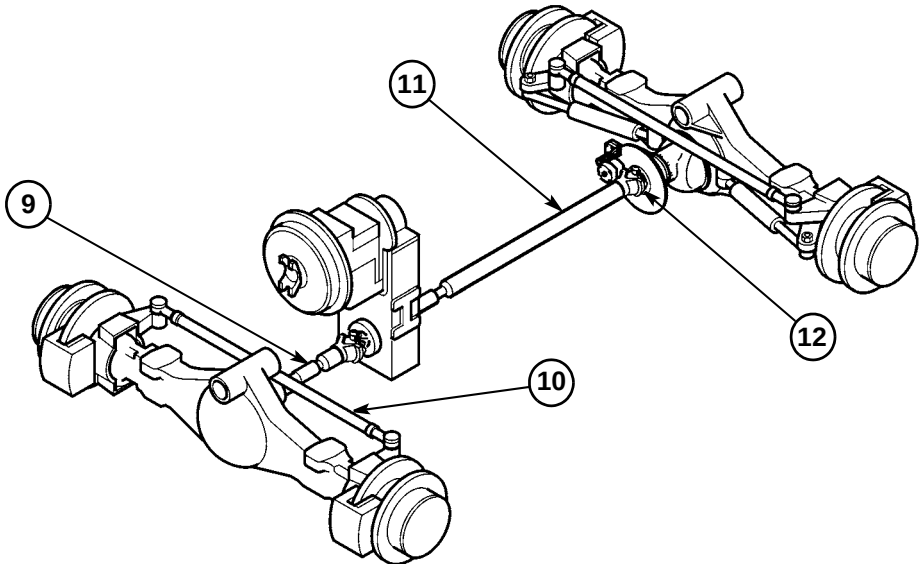
NOTE

Contact Unit Maintenance to perform steps e through m.

2-31. TOWING THE ATLAS (CONT)

e. Remove four bolts and lockwashers and disconnect rear propeller shaft (9) from rear differential yoke (10). Discard lockwasher. Secure end of the propeller shaft in hanger hook provided underneath vehicle.

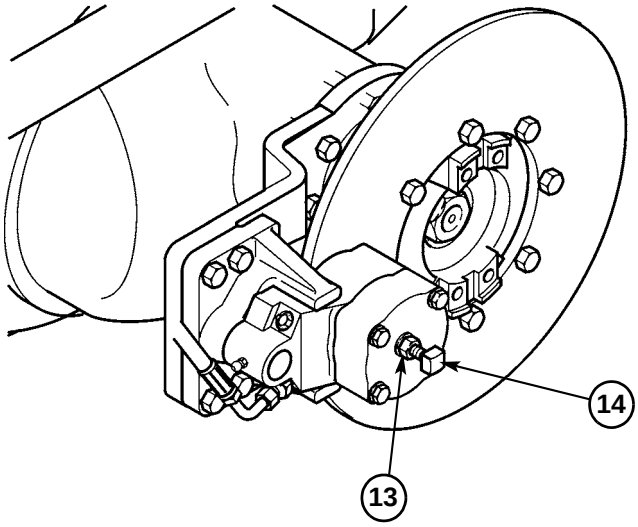
f. Remove four bolts and lockwasher and disconnect front propeller shaft (11) from front differential yoke (12). Discard lockwasher. Secure end of the propeller shaft in hanger provided underneath vehicle.



g. Attach the tow bar to the tow lugs of the ATLAS.

h. With the aid of a ground guide, move towing vehicle into position. Two personnel are required to lift the tow bar to towing vehicle pintle.

i. Disengage parking brake by loosening locknut (13) and adjusting screw (14) on brake caliper. Retighten locknut.



j. Remove wheel chocks. Ensure that all personnel and equipment are clear. Proceed to tow with caution.

k. After towing of the ATLAS is completed, chock the wheels and reconnect propeller shafts, using new lockwashers, and remove quick-connect hose (5).

l. With the wheels still chocked, adjust the parking brake as follows:

(1.0) Start engine and release parking brake.

(1) Place a 0.012 in. (0.30 mm) shim between the brake disc and one of the linings.

(2) Tighten the adjusting screw (14) clockwise until it is just possible to remove the shim.

(3) Tighten the locknut (13) while holding the adjusting screw (14) with a wrench.

(4) Remove the shim.

(5) Apply parking brake, stop engine and remove wheel chocks.

m. Bleed any trapped air from steering system using the following procedure:

(1) Synchronize steering as described in Para 2-9.

(2) Turn the steering wheel two full turns right and left in all three steering modes.

2-32. EMERGENCY BOOM OPERATIONS

WARNING

If engine power is lost with the boom extended or raised, boom must be fully retracted before it is lowered to prevent vehicle damage or injury or death to personnel.

NOTE

Contact Unit Maintenance to perform necessary preparation of the ATLAS for emergency boom operations.

a. Emergency Boom Retracting. Whenever an emergency situation prevents the use of engine power for retracting the boom, proceed as follows:

(1) Turn engine start switch to OFF position to stop engine.

WARNING

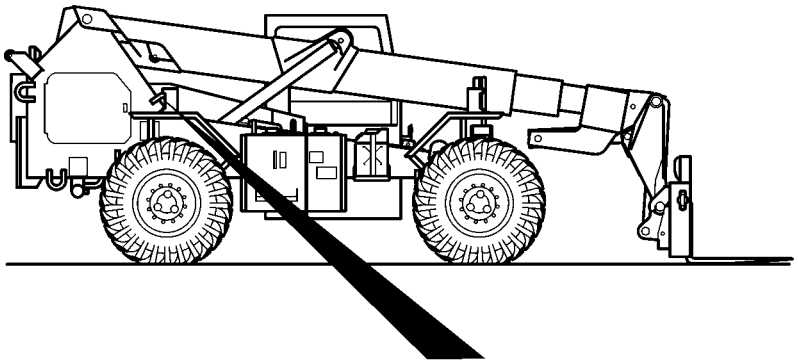
- Hydraulic oil in the system can be under pressures over 3000 psi with engine OFF. Always relieve pressure in hydraulic lines before attempting to remove any component in the hydraulic system. With engine OFF, starter-run control switch in RUN position, and attachment on the ground, move all control levers through all operating positions several times to relieve line pressure. Relieve pressure in hydraulic oil tank by loosening filler cap very slowly. Failure to comply could result in injury or death to personnel.
- Hydraulic oil is flammable. Ensure engine is cool to prevent fire. Injury or death to personnel could result.
- Oil is slippery and can cause falls. To avoid injury, wipe up spilled oil with wiping rags.

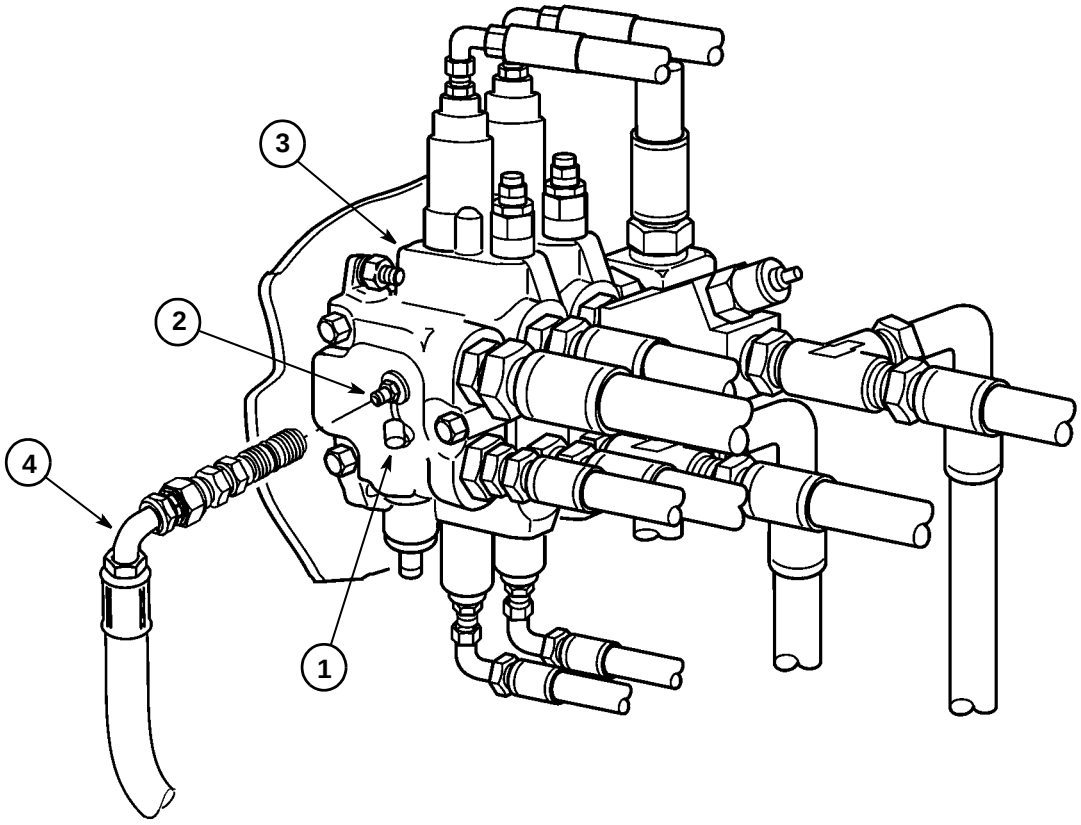
(2) Remove the transmission cover, if necessary, to gain access to diagnostic nipple of main control valve.

2-32. EMERGENCY BOOM OPERATIONS (CONT)

(3) Remove dust cap (1) from diagnostic nipple (2) at side of main control valve (3).

(4) Connect “L” shaped end of quick-connect hose (4) (BII) to diagnostic nipple (2).





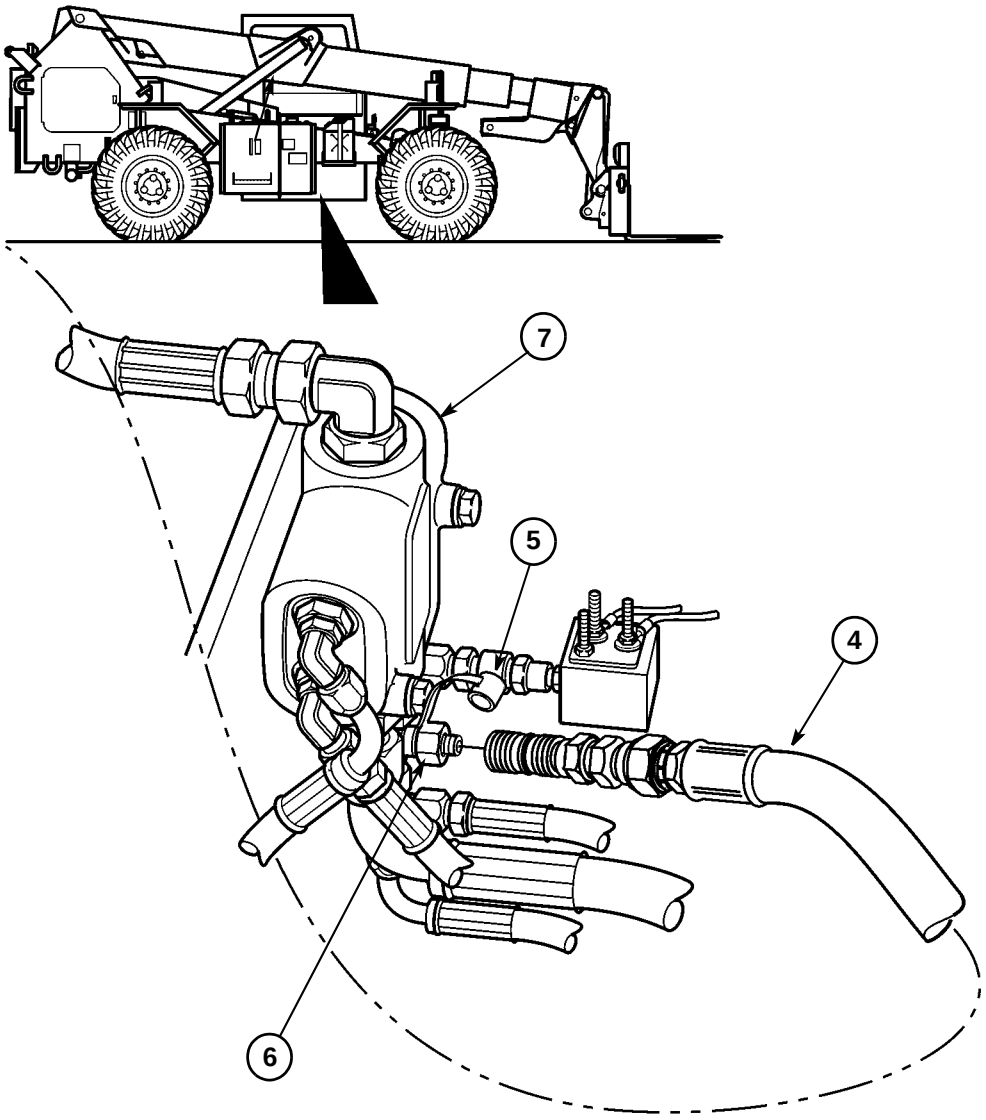
(5) Route quick-connect hose (4) down through vehicle frame along side or in front of transmission.

NOTE

- Configuration of hydraulic bypass switch of priority valve may differ from switch shown.
- Hoses and fittings are shown out of true position for clarity.

(6) Remove dust cap (5) from diagnostic nipple (6) in one of three tee fittings of priority valve (7)

(7) Connect other end of quick-connect hose (4) to diagnostic nipple (6).



WARNING

Do not operate vehicle with the emergency steer switch in OFF position. If engine power is lost, there will also be a loss of emergency steering capability. Failure to follow this precaution could result in injury or death to personnel.

(8) Turn the emergency steer pump switch to ON position.

(9) Turn the engine start switch to ACCESSORY position. DO NOT start the engine.

NOTE

If required to retract and lower or retract and raise the boom, always retract the boom first.

(10) Using the hydraulic joystick, immediately place joystick in RETRACT position, or in RAISE or LOWER position as necessary. Hold joystick in position.

2-32. EMERGENCY BOOM OPERATIONS (CONT)

(11) While holding joystick, turn steering wheel to right and left so emergency steer pump turns wheels slightly. This activates main control valve and boom will start moving. If movement is extremely slow, refer to step 22, otherwise continue with step 12.

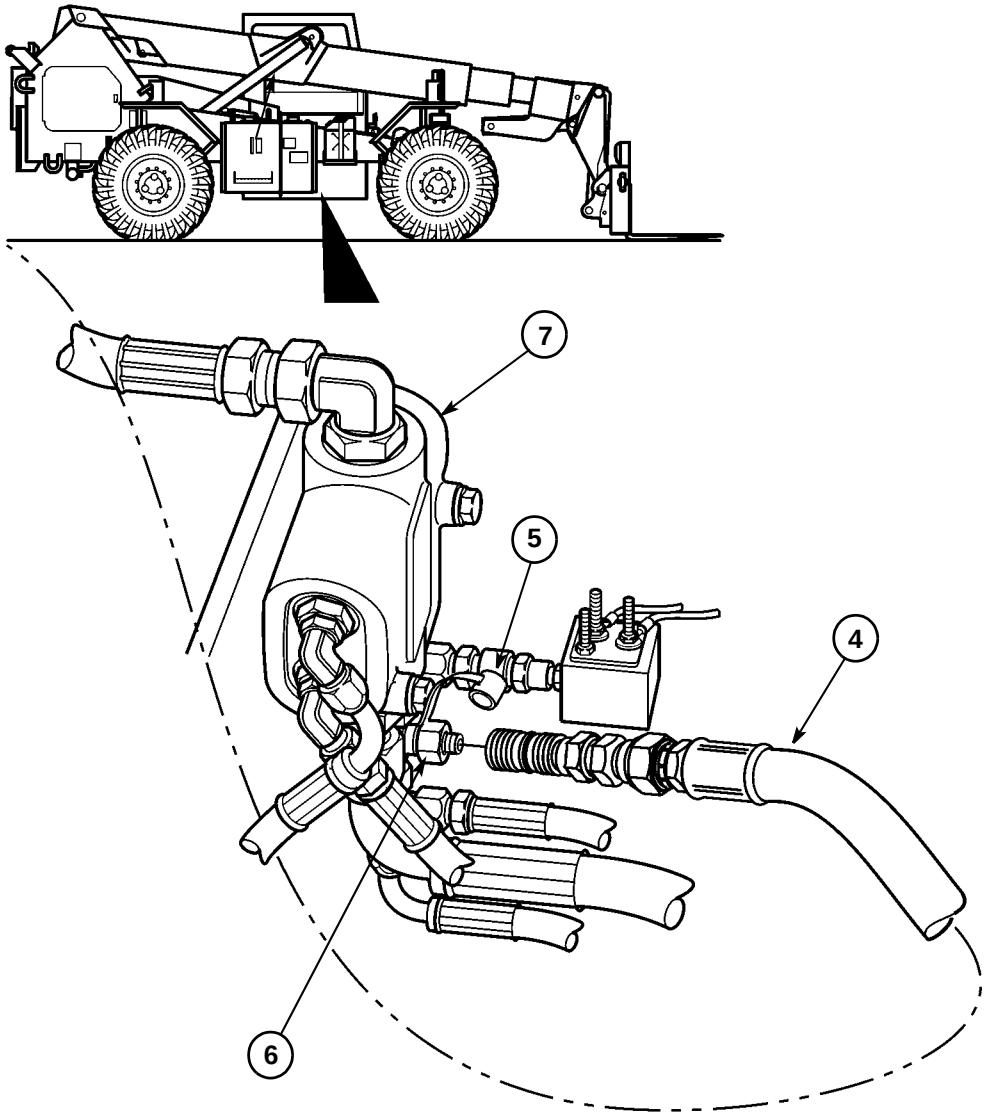
(12) When boom is fully retracted, immediately place joystick in RAISE or LOWER position as necessary to move boom to desired position.

(13) Release joystick and turn emergency steer switch and engine start switch to OFF position.

(14) Disconnect quick-connect hose (4) from diagnostic nipple (6) in tee fitting (8) of priority valve (7).

(15) Install dust cap (5) to diagnostic nipple (6).

(16) Disconnect “L” shaped end of quick-connect hose (4) from diagnostic nipple (2) and remove quick-connect hose from vehicle.



(17) Install dust cap (1) to diagnostic nipple (2) at side of main control valve (3).

(18) Install transmission cover.

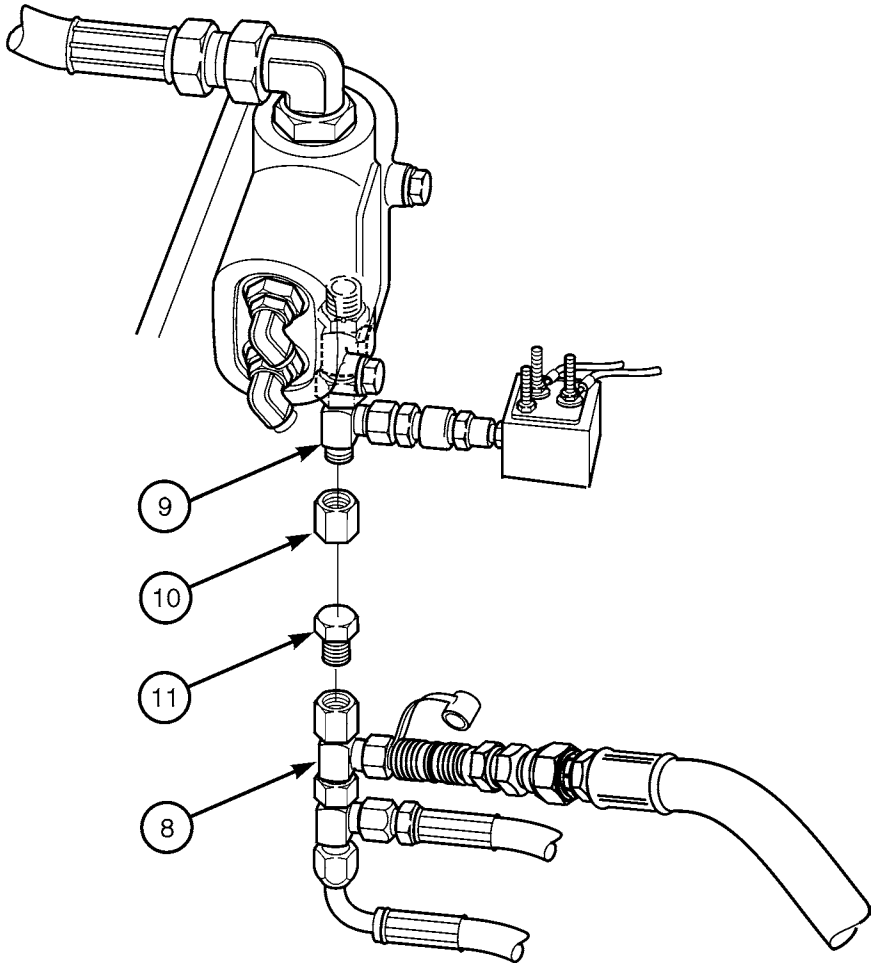
NOTE

- Contact Unit Maintenance to perform steps 19 through 26.
- Perform the following steps if cap and plug were installed at priority valve.

(19) Remove plug (11) from female threads of tee (8).

(20) Remove cap (10) from male threads of tee (9).

(21) Connect tee (8) to tee (9).



NOTE

- Two to five minutes is normally required to restore boom from a fully raised and fully extended position. When wear on main gear pump permits internal leakage, additional time will be required.
- If while performing step 11 it is evident that boom movement is excessively slow, the following steps can be performed.

(22) Release joystick and turn emergency steer pump switch to OFF position.

(23) Disconnect tee (8) from tee (9).

2-32. EMERGENCY BOOM OPERATIONS (CONT)

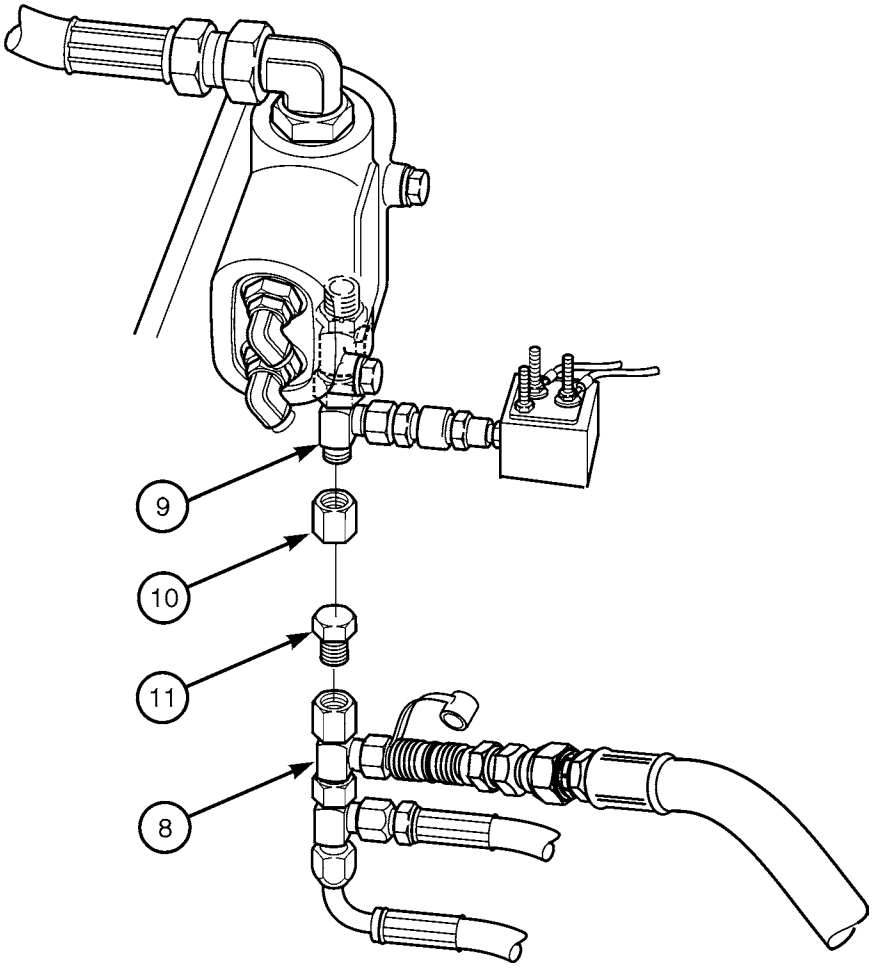
NOTE

Cap and plug are BII items.

(24) Install cap (10) to male threads of tee (9).

(25) Install plug (11) to female threads of tee (8).

(26) Turn emergency steer pump switch ON and perform steps 11 through 18.



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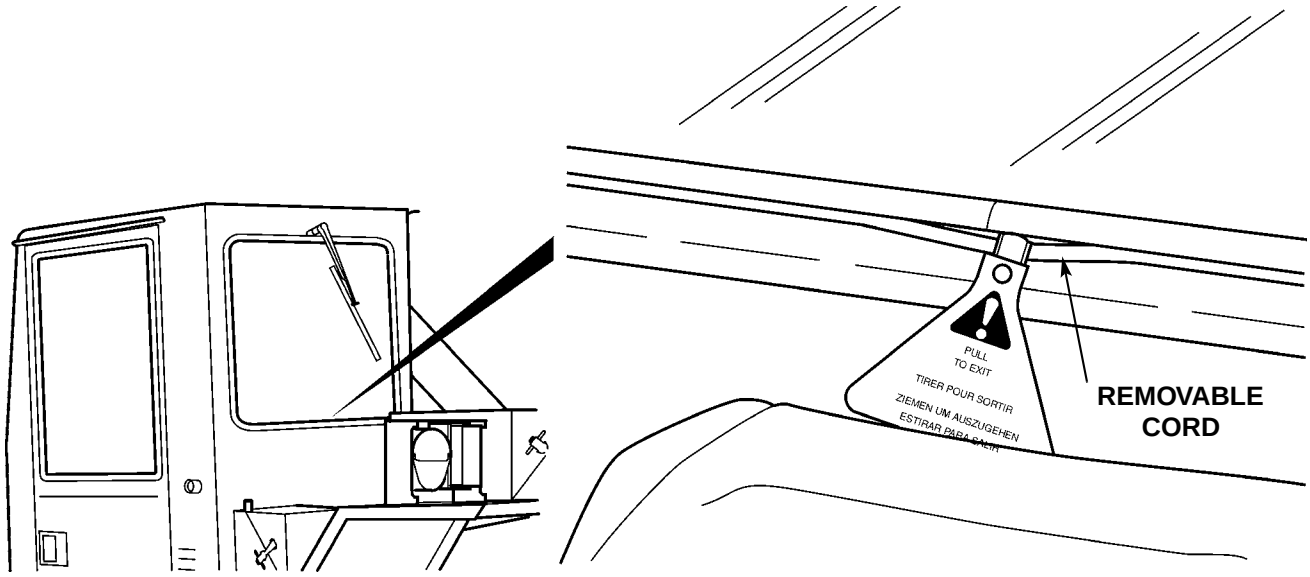
2-33. REAR WINDOW EMERGENCY EXIT



Rear window can be used as an emergency exit when exit through the cab doors cannot be made. To open the emergency exit, proceed as follows:

0. Pull out the removable cord.

a. Push the window out.

b. Exit can be made by crawling out the opening.

CHAPTER 3

OPERATOR MAINTENANCE INSTRUCTIONS

Para	Contents	Page
	Section I. Lubrication Instructions	
3-1.	Lubrication	3-1
	Section II. Troubleshooting Procedures	
3-2.	General	3-1
3-3.	Troubleshooting	3-1
	Section III. Operator Maintenance Procedures	
3-4.	Introduction	3-7
3-5.	Engine Oil Sampling Valve – Service	3-7
3-6.	Transmission Oil Sampling Valve – Service	3-8
3-7.	Hydraulic Oil Sampling Valve – Service	3-9
3-8.	Air Cleaner – Service	3-10
3-9.	Radiator – Service	3-14
3-10.	Fuel/Water Separator – Service	3-15

Section I. LUBRICATION INSTRUCTIONS

3-1. LUBRICATION

Perform all lubrication in accordance with the PMCS.

Section II. TROUBLESHOOTING PROCEDURES

3-2. GENERAL

a. Table 3-1 lists the common malfunctions which you may find during the operation or maintenance of the ATLAS or its components. You should perform the tests/inspections and corrective actions in the order listed.

b. This manual cannot list all malfunctions that may occur, nor all tests or inspections and corrective actions. If a malfunction is not listed or is not corrected by listed corrective actions, notify your supervisor.

3-3. TROUBLESHOOTING

The malfunction index is a quick reference for the troubleshooting tables. It lists the malfunctions in the same order as they appear in the table with the corresponding page number. Refer to Table 3-1 for troubleshooting procedures.

Malfunction Index

Troubleshooting Procedure		Page
ENGINE		
1.	Engine will not crank	3-2
2.	Engine cranks but will not start	3-2
3.	Engine misfires or runs rough	3-3
4.	Low engine power	3-3
5.	Engine overheats	3-3
6.	Low engine oil pressure	3-4
7.	Vehicle starts but will not move	3-4
8.	Engine priming system does not work	3-4
9.	All hydraulic functions operate slowly or erratically	3-5
10.	Forks will not automatically level	3-5
11.	Only one heater/air conditioner fan operates	3-5
12.	Front and rear wheels are not aligned in the straight ahead position	3-5
13.	Poor or no brakes	3-5

Table 3-1. Troubleshooting

Malfunction / Test or Inspection / Corrective Action
1. ENGINE WILL NOT CRANK.
Check for loose or disconnected battery cables.
If cables are loose or disconnected, notify Unit Maintenance.
2. ENGINE CRANKS BUT WILL NOT START.
Step 1. Check to see if the auxiliary fuel shut-off switch is in the OFF position.
If so, move the auxiliary fuel shut-off switch to the ON position.
Do not overfill fuel tank, damage to equipment may result.
Step 2. Check to see if fuel tank is empty.
If tank is empty, fill fuel tank.
Step 3. Check ambient temperature.
Use the engine primer button in extreme cold temperature to start engine (refer to Para 2-24).
Step 4. Check the fuel/water separator for water.
If water is visible, drain fuel/water separator (refer to Para 3-10).

Table 3-1. Troubleshooting - CONT.

Malfunction Test or Inspection Corrective Action
Step 5. Check to see if any fuel lines are damaged. If lines are damaged, notify Unit Maintenance.
3. ENGINE MISFIRES OR RUNS ROUGH.
Do not overfill fuel tank, damage to equipment may result.
Step 1. Check to see if fuel tank is low or empty. If tank is low or empty, fill fuel tank.
Step 2. Check to see if any moisture is present in fuel/water separator. If moisture is visible, drain fuel/water separator (refer to Para 3-10).
Step 3. Check for black or gray exhaust smoke. Indicates plugged or dirty intake system. Clean or replace air filters (refer to Para 3-8).
Step 4. Check for white or blue smoke. Indicates engine is cold. Allow engine to warm up.
Step 5. Check for leaks in fuel lines and injectors. If lines or injectors are leaking, notify Unit Maintenance.
4. LOW ENGINE POWER.
Step 1. Check air filter restriction indicator. If necessary, clean or replace air filters (refer to Para 3-8).
Step 2. Check exhaust pipe for obstructions. If necessary, remove any obstruction.
Step 3. Check for high engine oil level. If oil level is high, notify Unit Maintenance.
5. ENGINE OVERHEATS.
Damage to the radiator can occur if pressure cap is removed with engine hot. Allow system to cool before checking coolant level. Failure to follow this precaution could result in vehicle damage or personal injury.

Table 3-1. Troubleshooting - CONT.

Malfunction Test or Inspection Corrective Action
Step 1. Check for low coolant level. If low, add appropriate amount of coolant to overflow bottle (refer to Para 3-9).
Step 2. Check for leaks and/or worn hoses. If hoses are leaking or worn, notify Unit Maintenance.
The engine and radiator can be extremely hot. Contacting exposed skin to these areas could result in severe burns.
Step 3. Check for obstructions and trash build-up on the radiator fins. If obstructed, clean radiator surface.
Step 4. Check for high engine oil level. If oil level is high, notify Unit Maintenance.
6. LOW ENGINE OIL PRESSURE.
Step 1. Check to see if engine oil level is low. If oil level is low, add oil as necessary (refer to the PMCS).
Step 2. Check for external oil leaks. If external leaks are visible, notify Unit Maintenance.
7. VEHICLE STARTS BUT WILL NOT MOVE.
Step 1. Check to be sure parking brake switch is in OFF position.
Step 2. Check transmission oil level. If oil level is low, add oil as necessary (refer to the PMCS).
Step 3. Check if parking brake is dragging. If brake is dragging, notify Unit Maintenance.
Step 4. Check if service brakes are dragging. If brakes are dragging, notify Unit Maintenance.
Step 5. Check transmission disconnect pedal for free movement. If no free movement, notify Unit Maintenance.
8. ENGINE PRIMING SYSTEM DOES NOT WORK.
Check ambient temperature. The priming system will not work if ambient temperature is above 34° ±8°F.

Table 3-1. Troubleshooting - CONT.

Malfunction Test or Inspection Corrective Action
9. ALL HYDRAULIC FUNCTIONS OPERATE SLOWLY OR ERRATICALLY.
Step 1. Check to see if hydraulic oil is cold. Operate hydraulic system until oil is warm (refer to Para 2-24).
Step 2. Check to see if hydraulic oil level is low. If oil level is low, add oil as necessary (refer to the PMCS).
Step 3. Check to see if hydraulic oil is contaminated with water. If oil is contaminated, notify Unit Maintenance.
Step 4. Engine speed too low. Increase engine speed with accelerator.
Step 5. Inspect hydraulic lines for signs of damage or leaks. If lines are damaged or leaking, notify Unit Maintenance.
10. FORKS WILL NOT AUTOMATICALLY LEVEL.
Step 1. Check to see if the automatic fork level switch is in the ON position. If not, move the automatic fork level switch to the ON position.
Step 2. Check for damaged or broken wire(s) from toggle switch to fork autoleveler switch. If wires are damaged or broken, notify Unit Maintenance.
11. ONLY ONE HEATER/AIR CONDITIONER FAN OPERATES.
Check to see if the heater blower switch is in the LOW speed position. Move the heater blower switch to the HIGH speed position. Only one fan operates on low speed. At high speed, both fans operate. If malfunction is not corrected, notify Unit Maintenance.
12. FRONT AND REAR WHEELS ARE NOT ALIGNED IN THE STRAIGHT AHEAD POSITION.
Check to see if the steer select control switch is in the CRAB or FOUR WHEEL position. The front and rear wheels do not always align straight ahead after changing steering modes. Proceed with steering system synchronization (refer to Para 2-9).
13. POOR OR NO BRAKES.
Step 1. Check hydraulic oil level at reservoir sight glass. If oil level is low, add oil as necessary (refer to the PMCS).

Table 3-1. Troubleshooting - CONT.

Malfunction Test or Inspection Corrective Action	
Step 2.	Check for oil leakage at brake calipers or hose connections. If calipers or hose connections are leaking, notify Unit Maintenance.

Section III. OPERATOR MAINTENANCE PROCEDURES

3-4. INTRODUCTION

This section contains maintenance procedures which are the responsibility of the operator. Refer to Para 2-3, the Preventive Maintenance Checks and Services, for additional maintenance not covered in this section. The maintenance procedures in this manual are authorized by the Maintenance Allocation Chart (refer to TM 10-3930-673-20).

3-5. ENGINE OIL SAMPLING VALVE – SERVICE

This Task Covers:

Obtaining an engine oil sample for the Army Oil Analysis Program (AOAP).

Service.

(1) Clean the engine oil sampling valve (1).

(2) Start engine (refer to Para 2-7). Bring engine to normal operating temperature.

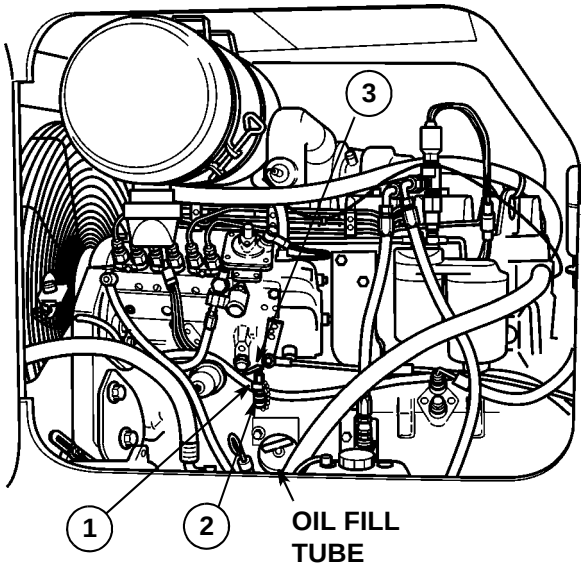
(3) Obtain oil sample.

(a) With engine at idle, remove the dust cap (2) on the oil sampling valve (1).

(b) Attach an appropriate size hose to the valve, if desired.

(c) Place a clean container under the valve (1) opening (or hose, if used).

(d) Push down or pull up on the lever (3) to drain approximately one pint of oil prior to taking sample.



(e) Place a sample bottle under the valve opening (or hose, if used) and fill to within 1/2” from top. Cap bottle immediately.

(f) Install the dust cap (2) on the oil sampling valve (1).

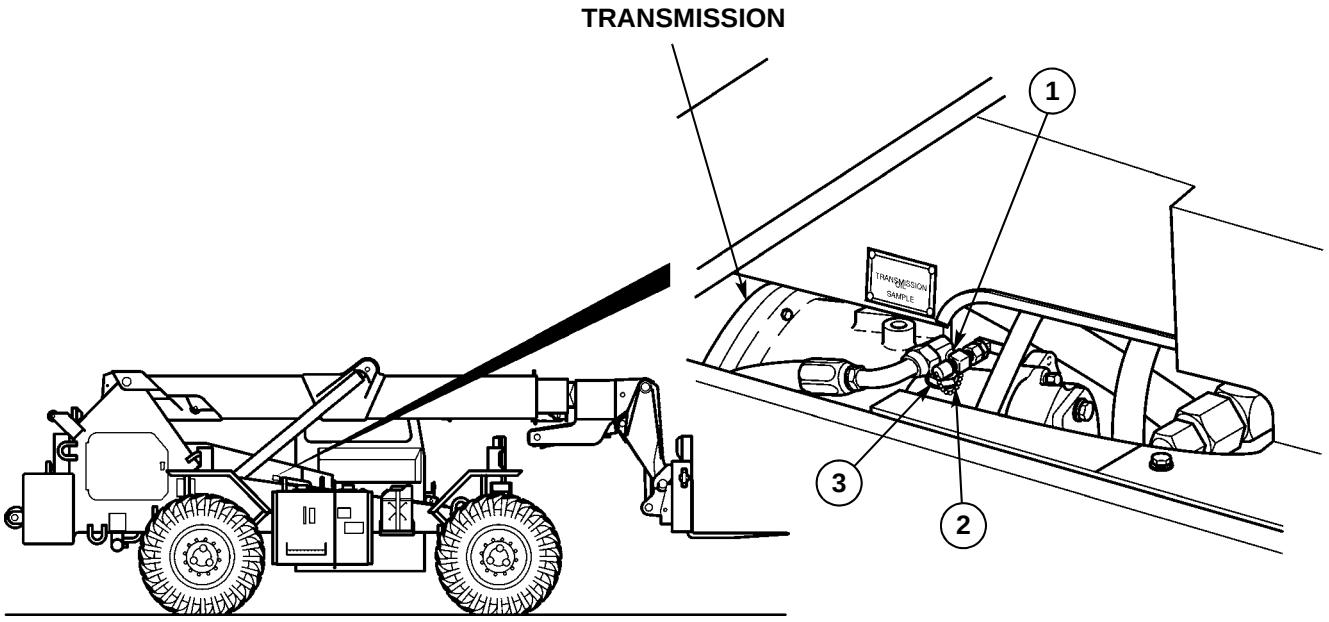
(g) Check oil level and add oil if necessary (refer to the PMCS).

3-6. TRANSMISSION OIL SAMPLING VALVE – SERVICE

This Task Covers:

Obtaining a transmission oil sample for the Army Oil Analysis Program (AOAP).

Service.



(1) Clean the transmission oil sampling valve (1).

(2) Start engine (refer to Para 2-7). Drive vehicle approximately one mile or allow to idle in gear for a while to bring transmission to normal operating temperature.

(3) With engine running, place the travel select control lever in neutral. Move the parking brake switch to the ON position.

(4) Obtain oil sample.

(a) Remove the dust cap (2) on the transmission oil sampling valve (1).

(b) Attach an appropriate size hose to the valve (if desired).

(c) Place a clean container under the valve (1) opening (or hose, if used).

(d) Push down or pull up on the lever (3) to drain approximately one pint of oil prior to taking sample. Release the lever (3) to close the valve (1).

(e) Place a sample bottle under the valve opening (or hose, if used) and fill to within 1/2” from top. Cap bottle immediately.

(f) Install the dust cap (2) on the transmission oil sampling valve (1).

(g) Check transmission fluid level and add oil if necessary (refer to the PMCS).

3-7. HYDRAULIC OIL SAMPLING VALVE – SERVICE

This Task Covers:

Obtaining a hydraulic oil sample for the Army Oil Analysis Program (AOAP).

Service.

(1) Clean the hydraulic oil sampling valve (1).

(2) Start engine (refer to Para 2-7). Operate hydraulic system until oil is warm (refer to Para 2-24).

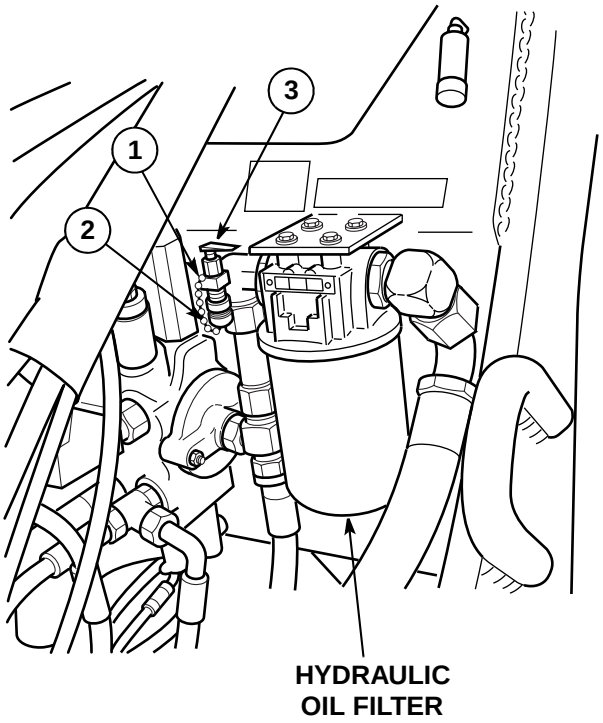
(3) Obtain oil sample.

(a) Remove the dust cap (2) on the hydraulic oil sampling valve (1).

(b) Attach an appropriate size hose to the valve (if desired).

(c) Place a clean container under the valve (1) opening (or hose, if used).

(d) Push down or pull up on the lever (3) to drain approximately one pint of oil prior to taking sample. Release the lever (3) to close the valve (1).



(e) Place a sample bottle under the valve opening (or hose, if used) and fill to within 1/2” from top. Cap bottle immediately.

(f) Install the dust cap (2) on the hydraulic oil sampling valve (1). Return the oil drained into container during Step (d) above to hydraulic reservoir.

(g) Check hydraulic oil level and add oil if necessary (refer to the PMCS).

3-8. AIR CLEANER – SERVICE

This Task Covers:

Inspecting the primary and secondary air filter elements. Cleaning or replacing elements as necessary.

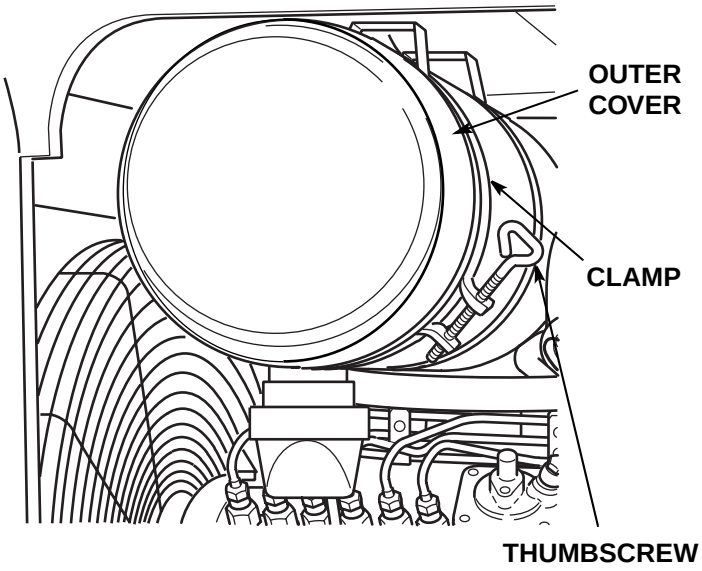
Service.

WARNING

If NBC exposure is suspected, all air filter media should be handled by personnel wearing protective equipment. Consult your unit NBC Officer or NBC NCO for appropriate handling or disposal instructions.

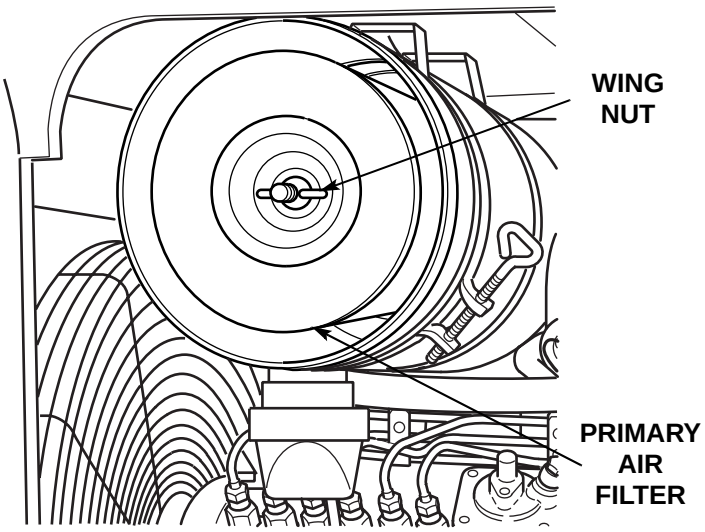
(1) Remove primary air filter element.

(a) Turn thumbscrew and loosen clamp. Remove air cleaner outer cover.

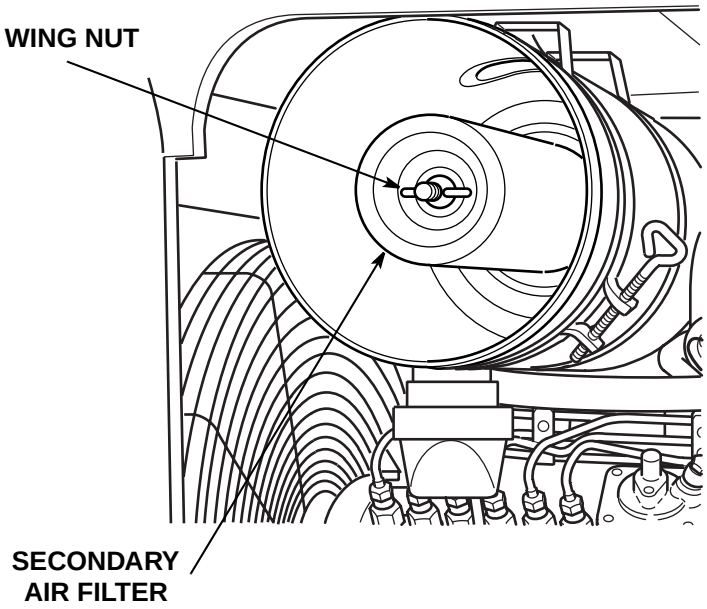


(b) Remove wing nut and primary filter element from inside of outer cover.

(c) Use a damp cloth to remove dust and foreign material from inside canister.



(2) Inspect secondary air filter element.



CAUTION

The secondary element is not intended to be cleaned. For maximum engine protection and air cleaner service life, replace the secondary element with a new one every third primary element change or cleaning.

(a) Check secondary element for damage. Replace element if it has the slightest damage to gasket or pleated element.

(b) Replace secondary element if element is visibly dirty.

(c) If secondary element is to be replaced, remove wing nut to remove element.

CAUTION

Air restriction indicator will not function properly if an element has a break in the filtering paper or if the element is not properly seated in the canister.

(d) Install new secondary element with gasket end in canister first. Be sure element is centered in canister before tightening wing nut.

(3) Clean primary air filter element.

CAUTION

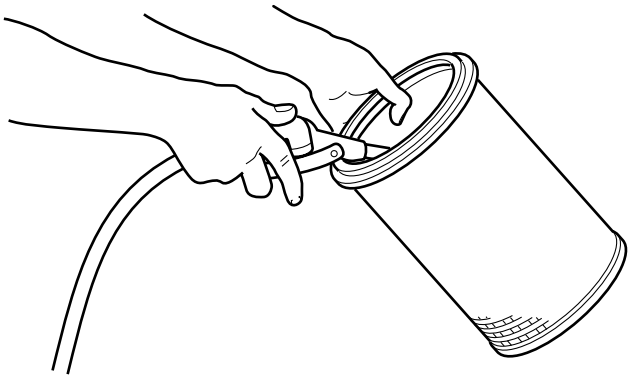
Do not tap the element against a hard surface, as this damages element.

(a) Remove loose dust by tapping element with palm of your hand. DO NOT use a hard surface.

3-8. AIR CLEANER – SERVICE (CONT)

WARNING

Always wear safety glasses whenever compressed air is used. Do not exceed 30 psig nozzle pressure when using compressed air.



(b) To remove remaining dust, use compressed air under 30 psig. Blow air up and down the pleats from the inside of the element. Be careful not to damage or tear paper element.

CAUTION

DO NOT wash element in fuel oil, oil, gasoline, or solvent. DO NOT use compressed air to remove water from an element.

(c) To clean oily or sooty element, wash thoroughly with warm water and nonfoaming detergent. Rinse element with clean water and allow element to air dry. Clean outer cover and rubber evacuator valve with soap and water.

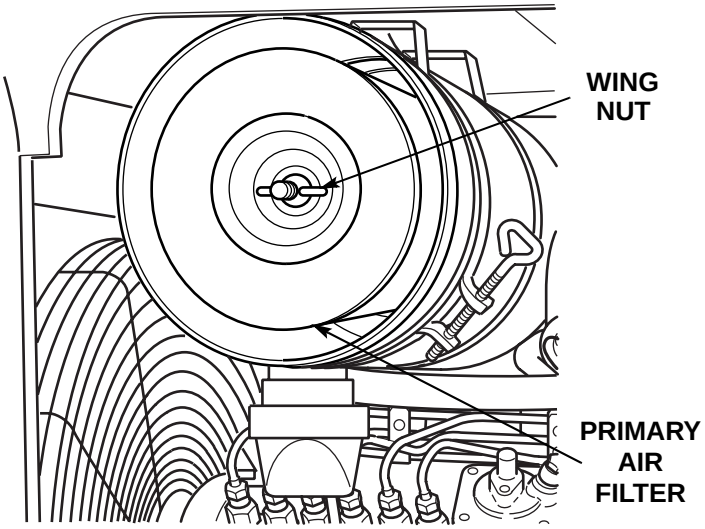
(4) Install primary air filter element.

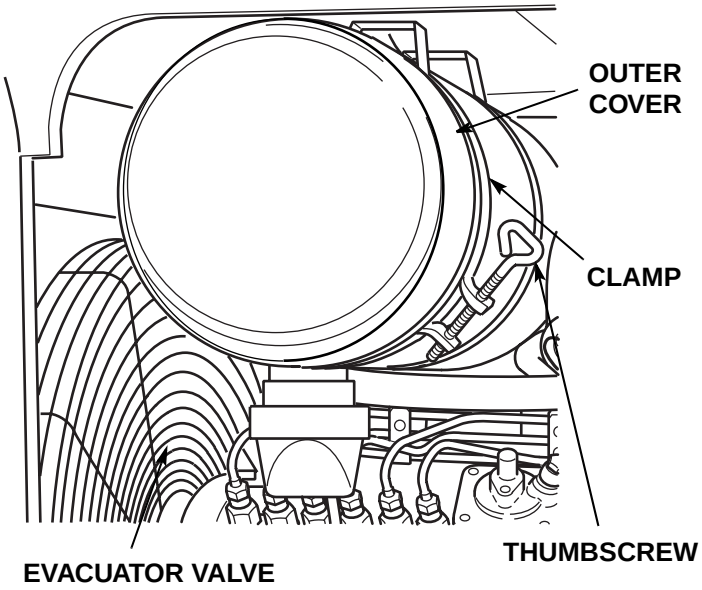
(a) DO NOT install element until it is dry.

(b) Inspect element for damage. Place a bright light inside the element and rotate element slowly. If any rupture, holes or damaged gaskets are discovered, replace the element.

(c) If a new element is to be installed, inspect the element and gasket for shipping and storage damage.

(d) Install the primary filter element in air cleaner outer cover and secure with wing nut.





(e) Install the outer cover and clamp. Tighten thumbscrew.

(f) Check the rubber evacuator valve to be sure it is not plugged or damaged.

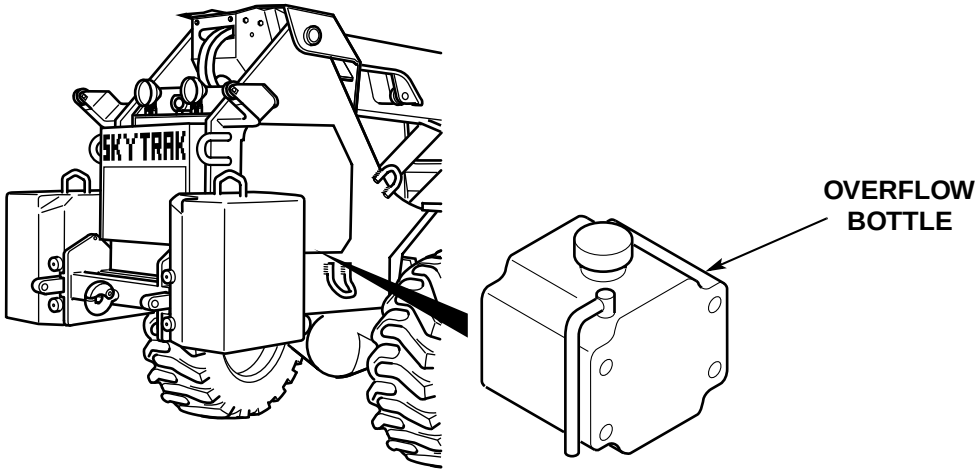
(g) Reset the air intake restriction indicator by pressing button on end of indicator.

3-9. RADIATOR – SERVICE

This Task Covers:

Checking radiator coolant level and adding coolant as necessary.

Service.



(1) Check coolant level in overflow bottle. Bottle must be 1/3 to 2/3 full.

NOTE

Use a 50-50 mix of ethylene glycol (MIL-A-46153B) and clean water for coolant. Plain water is not recommended. Make coolant mixture before adding ethylene glycol and water to the coolant bottle.

(2) Add coolant to overflow bottle.

(a) If bottle is less than 1/3 full, add approximately one quart.

WARNING

The cooling system operates under pressure which is controlled by the radiator cap. It is dangerous to remove the cap while system is hot because hot steaming gases will escape and burn you. Always allow system to cool, then turn the cap to the first stop and allow the pressure to escape before removing the cap completely.

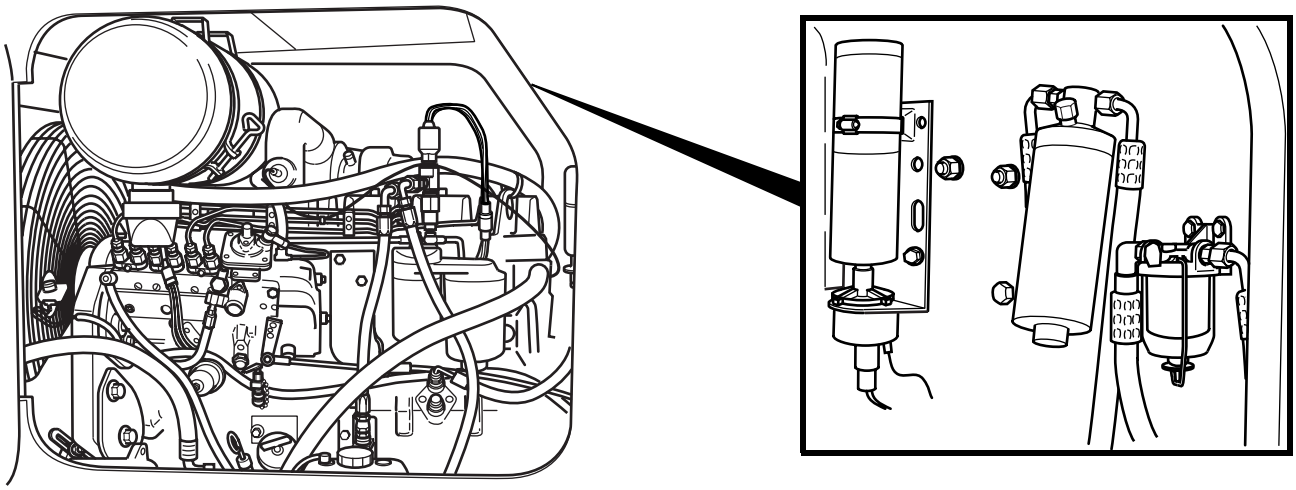
(b) If no coolant is visible in the bottle, add 2 quarts of coolant to bottle and fill radiator with coolant.

3-10. FUEL/WATER SEPARATOR – SERVICE

This Task Covers:

Draining water from engine fuel/water separator.

FUEL/WATER SEPARATOR



RIGHT SIDE OF ENGINE COMPARTMENT

Service.

(1) Look through fuel/water separator glass for presence of water or sediment.

(2) Drain water and sediment from fuel/water separator.

(a) Loosen retaining nut at bottom of sediment bowl.

(b) Pull retaining bracket forward.

(c) Remove sediment bowl and discard contents.

(d) Re-install sediment bowl.

(e) Swing retaining bracket under sediment bowl.

(f) Tighten retaining nut finger tight.

Malfunction Index

Troubleshooting Procedure		Page
ENGINE		
1.	Engine will not crank	3-2
2.	Engine cranks but will not start	3-2
3.	Engine misfires or runs rough	3-3
4.	Low engine power	3-3
5.	Engine overheats	3-3
6.	Low engine oil pressure	3-4
7.	Vehicle starts but will not move	3-4
8.	Engine priming system does not work	3-4
9.	All hydraulic functions operate slowly or erratically	3-5
10.	Forks will not automatically level	3-5
11.	Only one heater/air conditioner fan operates	3-5
12.	Front and rear wheels are not aligned in the straight ahead position	3-5
13.	Poor or no brakes	3-5

Table 3-1. Troubleshooting

Malfunction / Test or Inspection / Corrective Action
1. ENGINE WILL NOT CRANK.
Check for loose or disconnected battery cables.
If cables are loose or disconnected, notify Unit Maintenance.
2. ENGINE CRANKS BUT WILL NOT START.
Step 1. Check to see if the auxiliary fuel shut-off switch is in the OFF position.
If so, move the auxiliary fuel shut-off switch to the ON position.
Do not overfill fuel tank, damage to equipment may result.
Step 2. Check to see if fuel tank is empty.
If tank is empty, fill fuel tank.
Step 3. Check ambient temperature.
Use the engine primer button in extreme cold temperature to start engine (refer to Para 2-24).
Step 4. Check the fuel/water separator for water.
If water is visible, drain fuel/water separator (refer to Para 3-10).

Table 3-1. Troubleshooting - CONT.

Malfunction Test or Inspection Corrective Action
Step 5. Check to see if any fuel lines are damaged. If lines are damaged, notify Unit Maintenance.
3. ENGINE MISFIRES OR RUNS ROUGH.
Do not overfill fuel tank, damage to equipment may result.
Step 1. Check to see if fuel tank is low or empty. If tank is low or empty, fill fuel tank.
Step 2. Check to see if any moisture is present in fuel/water separator. If moisture is visible, drain fuel/water separator (refer to Para 3-10).
Step 3. Check for black or gray exhaust smoke. Indicates plugged or dirty intake system. Clean or replace air filters (refer to Para 3-8).
Step 4. Check for white or blue smoke. Indicates engine is cold. Allow engine to warm up.
Step 5. Check for leaks in fuel lines and injectors. If lines or injectors are leaking, notify Unit Maintenance.
4. LOW ENGINE POWER.
Step 1. Check air filter restriction indicator. If necessary, clean or replace air filters (refer to Para 3-8).
Step 2. Check exhaust pipe for obstructions. If necessary, remove any obstruction.
Step 3. Check for high engine oil level. If oil level is high, notify Unit Maintenance.
5. ENGINE OVERHEATS.
Damage to the radiator can occur if pressure cap is removed with engine hot. Allow system to cool before checking coolant level. Failure to follow this precaution could result in vehicle damage or personal injury.

Table 3-1. Troubleshooting - CONT.

Malfunction Test or Inspection Corrective Action
Step 1. Check for low coolant level. If low, add appropriate amount of coolant to overflow bottle (refer to Para 3-9).
Step 2. Check for leaks and/or worn hoses. If hoses are leaking or worn, notify Unit Maintenance.
The engine and radiator can be extremely hot. Contacting exposed skin to these areas could result in severe burns.
Step 3. Check for obstructions and trash build-up on the radiator fins. If obstructed, clean radiator surface.
Step 4. Check for high engine oil level. If oil level is high, notify Unit Maintenance.
6. LOW ENGINE OIL PRESSURE.
Step 1. Check to see if engine oil level is low. If oil level is low, add oil as necessary (refer to the PMCS).
Step 2. Check for external oil leaks. If external leaks are visible, notify Unit Maintenance.
7. VEHICLE STARTS BUT WILL NOT MOVE.
Step 1. Check to be sure parking brake switch is in OFF position.
Step 2. Check transmission oil level. If oil level is low, add oil as necessary (refer to the PMCS).
Step 3. Check if parking brake is dragging. If brake is dragging, notify Unit Maintenance.
Step 4. Check if service brakes are dragging. If brakes are dragging, notify Unit Maintenance.
Step 5. Check transmission disconnect pedal for free movement. If no free movement, notify Unit Maintenance.
8. ENGINE PRIMING SYSTEM DOES NOT WORK.
Check ambient temperature. The priming system will not work if ambient temperature is above 34° ±8°F.

Table 3-1. Troubleshooting - CONT.

Malfunction Test or Inspection Corrective Action
9. ALL HYDRAULIC FUNCTIONS OPERATE SLOWLY OR ERRATICALLY.
Step 1. Check to see if hydraulic oil is cold. Operate hydraulic system until oil is warm (refer to Para 2-24).
Step 2. Check to see if hydraulic oil level is low. If oil level is low, add oil as necessary (refer to the PMCS).
Step 3. Check to see if hydraulic oil is contaminated with water. If oil is contaminated, notify Unit Maintenance.
Step 4. Engine speed too low. Increase engine speed with accelerator.
Step 5. Inspect hydraulic lines for signs of damage or leaks. If lines are damaged or leaking, notify Unit Maintenance.
10. FORKS WILL NOT AUTOMATICALLY LEVEL.
Step 1. Check to see if the automatic fork level switch is in the ON position. If not, move the automatic fork level switch to the ON position.
Step 2. Check for damaged or broken wire(s) from toggle switch to fork autoleveler switch. If wires are damaged or broken, notify Unit Maintenance.
11. ONLY ONE HEATER/AIR CONDITIONER FAN OPERATES.
Check to see if the heater blower switch is in the LOW speed position. Move the heater blower switch to the HIGH speed position. Only one fan operates on low speed. At high speed, both fans operate. If malfunction is not corrected, notify Unit Maintenance.
12. FRONT AND REAR WHEELS ARE NOT ALIGNED IN THE STRAIGHT AHEAD POSITION.
Check to see if the steer select control switch is in the CRAB or FOUR WHEEL position. The front and rear wheels do not always align straight ahead after changing steering modes. Proceed with steering system synchronization (refer to Para 2-9).
13. POOR OR NO BRAKES.
Step 1. Check hydraulic oil level at reservoir sight glass. If oil level is low, add oil as necessary (refer to the PMCS).

Table 3-1. Troubleshooting - CONT.

Malfunction Test or Inspection Corrective Action	
Step 2.	Check for oil leakage at brake calipers or hose connections. If calipers or hose connections are leaking, notify Unit Maintenance.

Section III. OPERATOR MAINTENANCE PROCEDURES

3-4. INTRODUCTION

This section contains maintenance procedures which are the responsibility of the operator. Refer to Para 2-3, the Preventive Maintenance Checks and Services, for additional maintenance not covered in this section. The maintenance procedures in this manual are authorized by the Maintenance Allocation Chart (refer to TM 10-3930-673-20).

3-5. ENGINE OIL SAMPLING VALVE – SERVICE

This Task Covers:

Obtaining an engine oil sample for the Army Oil Analysis Program (AOAP).

Service.

(1) Clean the engine oil sampling valve (1).

(2) Start engine (refer to Para 2-7). Bring engine to normal operating temperature.

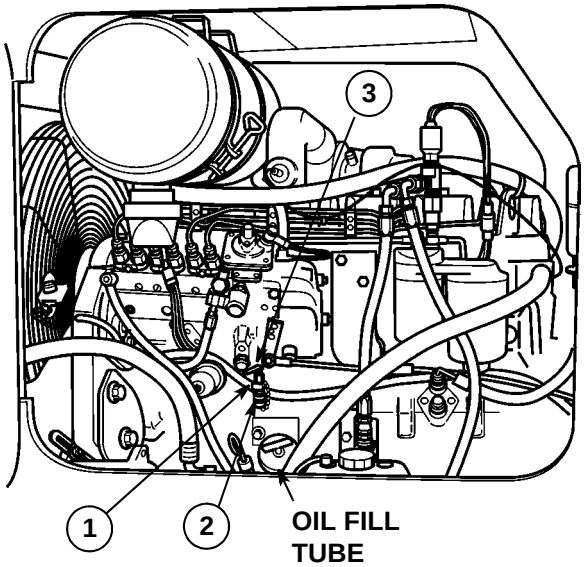
(3) Obtain oil sample.

(a) With engine at idle, remove the dust cap (2) on the oil sampling valve (1).

(b) Attach an appropriate size hose to the valve, if desired.

(c) Place a clean container under the valve (1) opening (or hose, if used).

(d) Push down or pull up on the lever (3) to drain approximately one pint of oil prior to taking sample.



(e) Place a sample bottle under the valve opening (or hose, if used) and fill to within 1/2” from top. Cap bottle immediately.

(f) Install the dust cap (2) on the oil sampling valve (1).

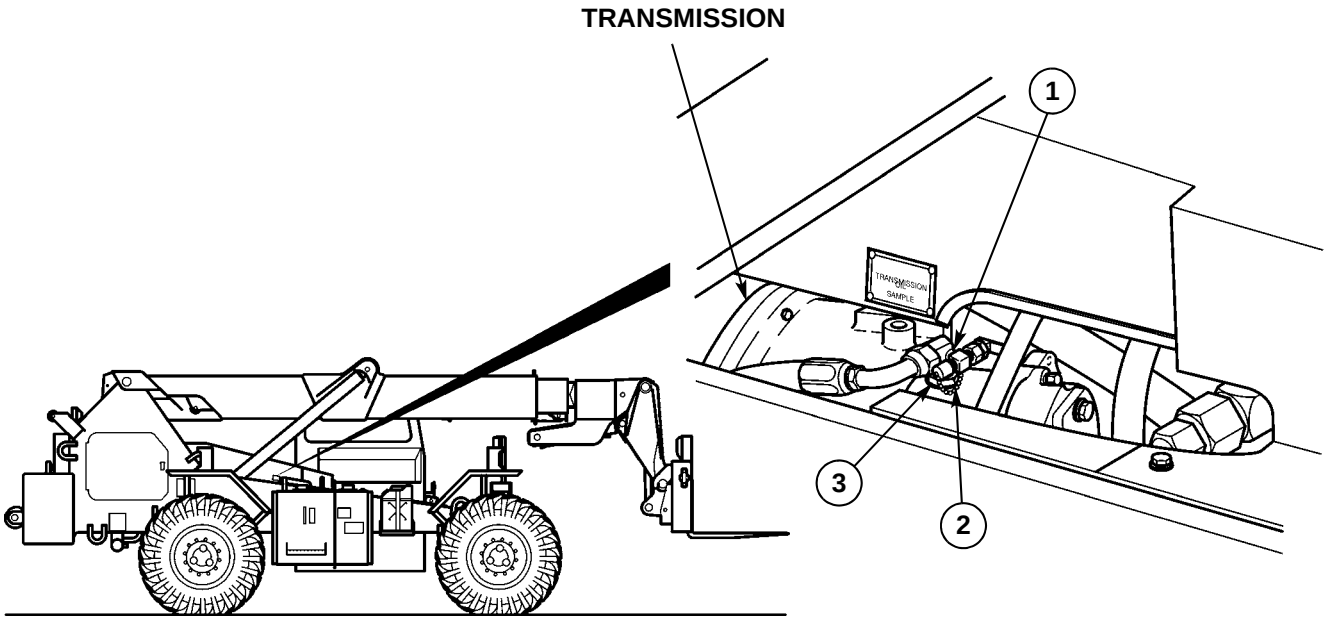
(g) Check oil level and add oil if necessary (refer to the PMCS).

3-6. TRANSMISSION OIL SAMPLING VALVE – SERVICE

This Task Covers:

Obtaining a transmission oil sample for the Army Oil Analysis Program (AOAP).

Service.



(1) Clean the transmission oil sampling valve (1).

(2) Start engine (refer to Para 2-7). Drive vehicle approximately one mile or allow to idle in gear for a while to bring transmission to normal operating temperature.

(3) With engine running, place the travel select control lever in neutral. Move the parking brake switch to the ON position.

(4) Obtain oil sample.

(a) Remove the dust cap (2) on the transmission oil sampling valve (1).

(b) Attach an appropriate size hose to the valve (if desired).

(c) Place a clean container under the valve (1) opening (or hose, if used).

(d) Push down or pull up on the lever (3) to drain approximately one pint of oil prior to taking sample. Release the lever (3) to close the valve (1).

(e) Place a sample bottle under the valve opening (or hose, if used) and fill to within 1/2” from top. Cap bottle immediately.

(f) Install the dust cap (2) on the transmission oil sampling valve (1).

(g) Check transmission fluid level and add oil if necessary (refer to the PMCS).

3-7. HYDRAULIC OIL SAMPLING VALVE – SERVICE

This Task Covers:

Obtaining a hydraulic oil sample for the Army Oil Analysis Program (AOAP).

Service.

(1) Clean the hydraulic oil sampling valve (1).

(2) Start engine (refer to Para 2-7). Operate hydraulic system until oil is warm (refer to Para 2-24).

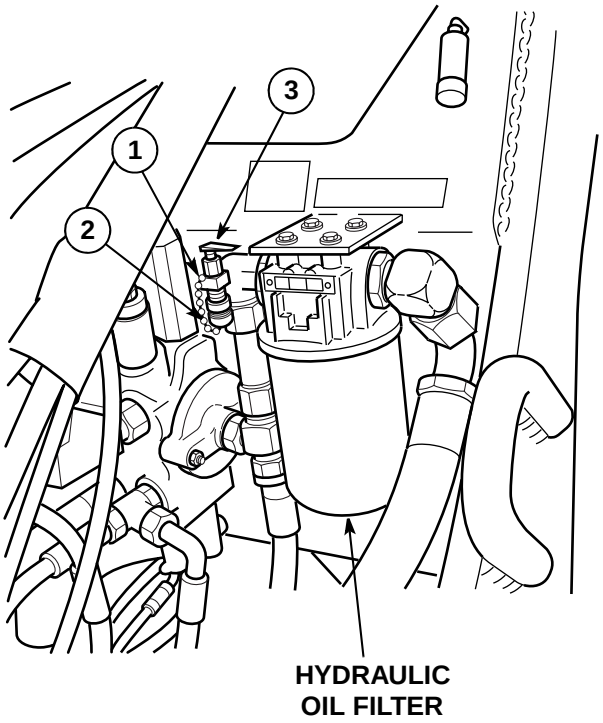
(3) Obtain oil sample.

(a) Remove the dust cap (2) on the hydraulic oil sampling valve (1).

(b) Attach an appropriate size hose to the valve (if desired).

(c) Place a clean container under the valve (1) opening (or hose, if used).

(d) Push down or pull up on the lever (3) to drain approximately one pint of oil prior to taking sample. Release the lever (3) to close the valve (1).



(e) Place a sample bottle under the valve opening (or hose, if used) and fill to within 1/2” from top. Cap bottle immediately.

(f) Install the dust cap (2) on the hydraulic oil sampling valve (1). Return the oil drained into container during Step (d) above to hydraulic reservoir.

(g) Check hydraulic oil level and add oil if necessary (refer to the PMCS).

3-8. AIR CLEANER – SERVICE

This Task Covers:

Inspecting the primary and secondary air filter elements. Cleaning or replacing elements as necessary.

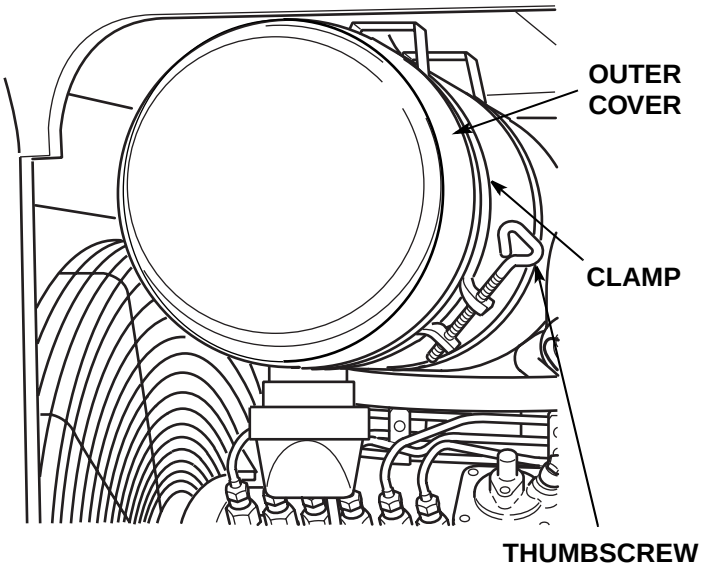
Service.

WARNING

If NBC exposure is suspected, all air filter media should be handled by personnel wearing protective equipment. Consult your unit NBC Officer or NBC NCO for appropriate handling or disposal instructions.

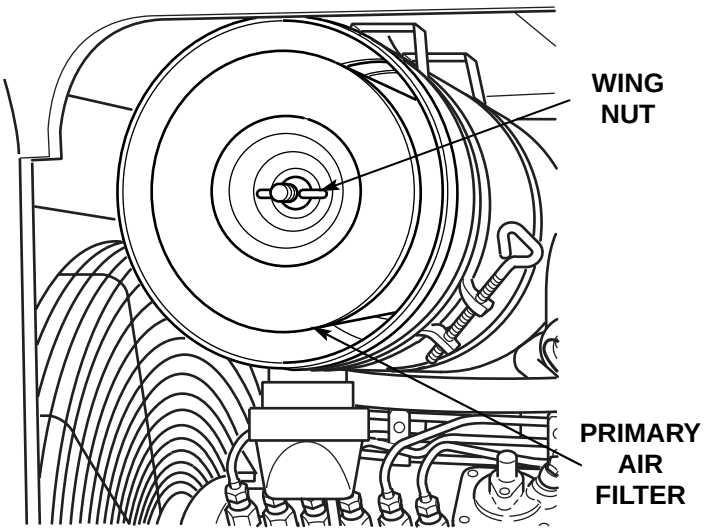
(1) Remove primary air filter element.

(a) Turn thumbscrew and loosen clamp. Remove air cleaner outer cover.

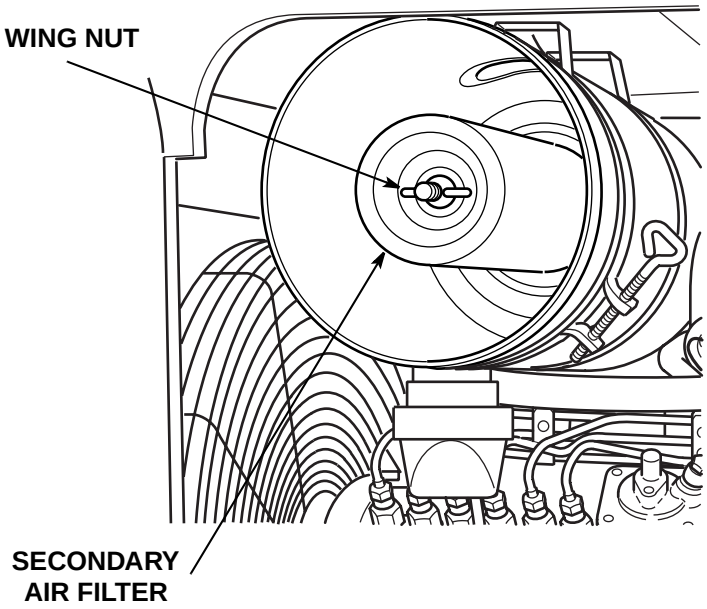


(b) Remove wing nut and primary filter element from inside of outer cover.

(c) Use a damp cloth to remove dust and foreign material from inside canister.



(2) Inspect secondary air filter element.



CAUTION

The secondary element is not intended to be cleaned. For maximum engine protection and air cleaner service life, replace the secondary element with a new one every third primary element change or cleaning.

(a) Check secondary element for damage. Replace element if it has the slightest damage to gasket or pleated element.

(b) Replace secondary element if element is visibly dirty.

(c) If secondary element is to be replaced, remove wing nut to remove element.

CAUTION

Air restriction indicator will not function properly if an element has a break in the filtering paper or if the element is not properly seated in the canister.

(d) Install new secondary element with gasket end in canister first. Be sure element is centered in canister before tightening wing nut.

(3) Clean primary air filter element.

CAUTION

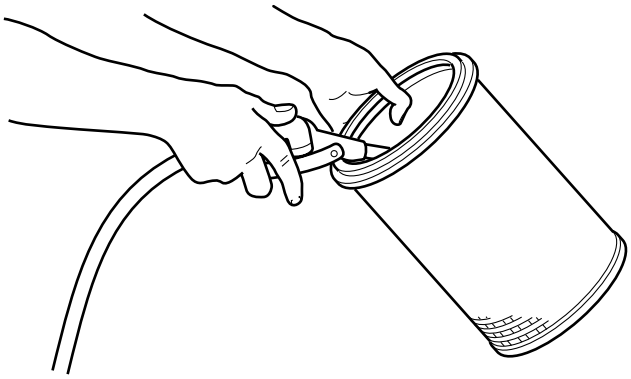
Do not tap the element against a hard surface, as this damages element.

(a) Remove loose dust by tapping element with palm of your hand. DO NOT use a hard surface.

3-8. AIR CLEANER – SERVICE (CONT)

WARNING

Always wear safety glasses whenever compressed air is used. Do not exceed 30 psig nozzle pressure when using compressed air.



(b) To remove remaining dust, use compressed air under 30 psig. Blow air up and down the pleats from the inside of the element. Be careful not to damage or tear paper element.

CAUTION

DO NOT wash element in fuel oil, oil, gasoline, or solvent. DO NOT use compressed air to remove water from an element.

(c) To clean oily or sooty element, wash thoroughly with warm water and nonfoaming detergent. Rinse element with clean water and allow element to air dry. Clean outer cover and rubber evacuator valve with soap and water.

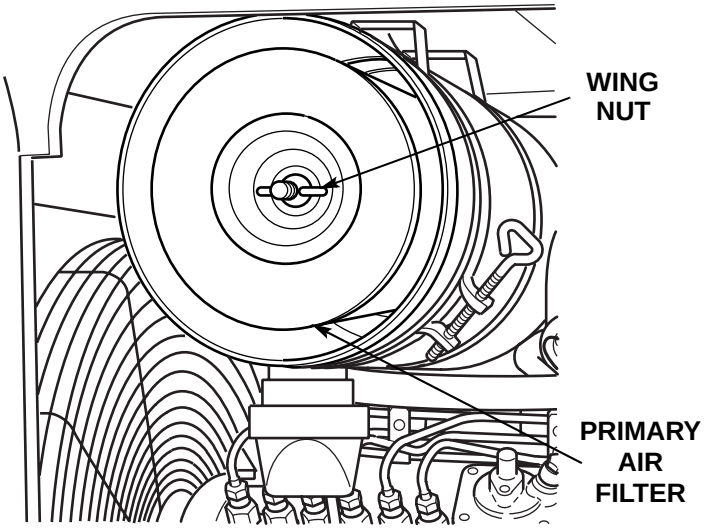
(4) Install primary air filter element.

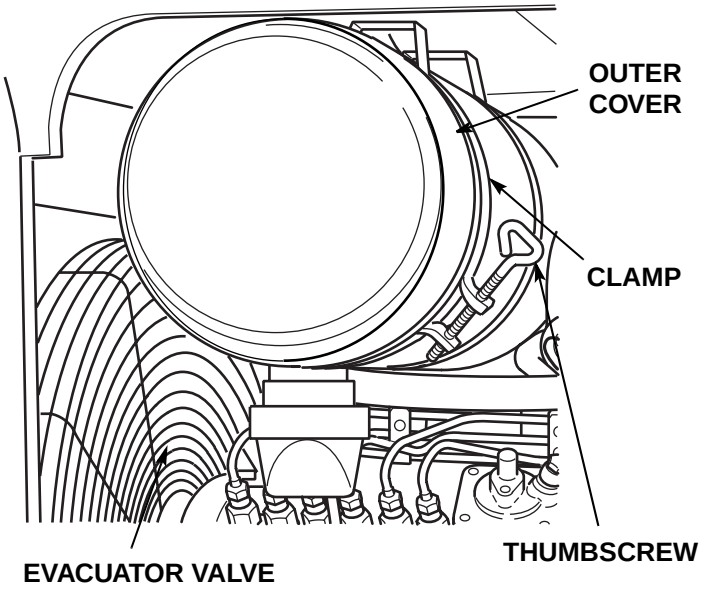
(a) DO NOT install element until it is dry.

(b) Inspect element for damage. Place a bright light inside the element and rotate element slowly. If any rupture, holes or damaged gaskets are discovered, replace the element.

(c) If a new element is to be installed, inspect the element and gasket for shipping and storage damage.

(d) Install the primary filter element in air cleaner outer cover and secure with wing nut.





(e) Install the outer cover and clamp. Tighten thumbscrew.

(f) Check the rubber evacuator valve to be sure it is not plugged or damaged.

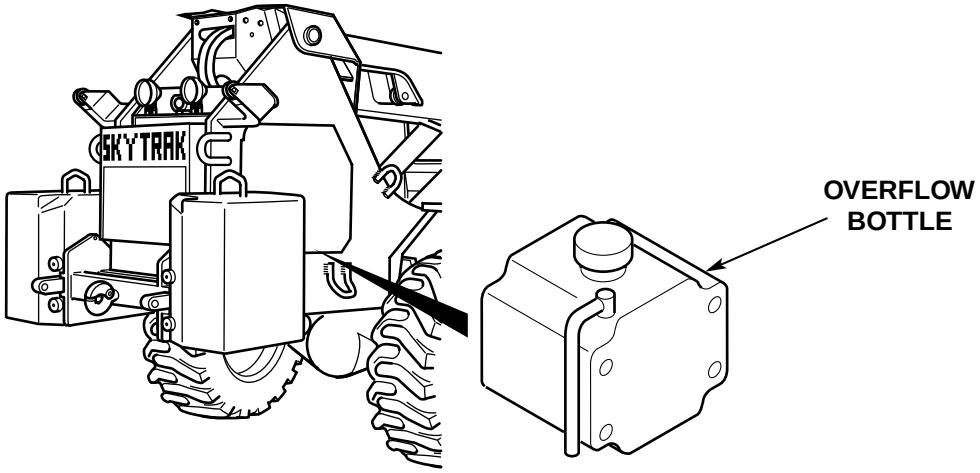
(g) Reset the air intake restriction indicator by pressing button on end of indicator.

3-9. RADIATOR – SERVICE

This Task Covers:

Checking radiator coolant level and adding coolant as necessary.

Service.



(1) Check coolant level in overflow bottle. Bottle must be 1/3 to 2/3 full.

NOTE

Use a 50-50 mix of ethylene glycol (MIL-A-46153B) and clean water for coolant. Plain water is not recommended. Make coolant mixture before adding ethylene glycol and water to the coolant bottle.

(2) Add coolant to overflow bottle.

(a) If bottle is less than 1/3 full, add approximately one quart.

WARNING

The cooling system operates under pressure which is controlled by the radiator cap. It is dangerous to remove the cap while system is hot because hot steaming gases will escape and burn you. Always allow system to cool, then turn the cap to the first stop and allow the pressure to escape before removing the cap completely.

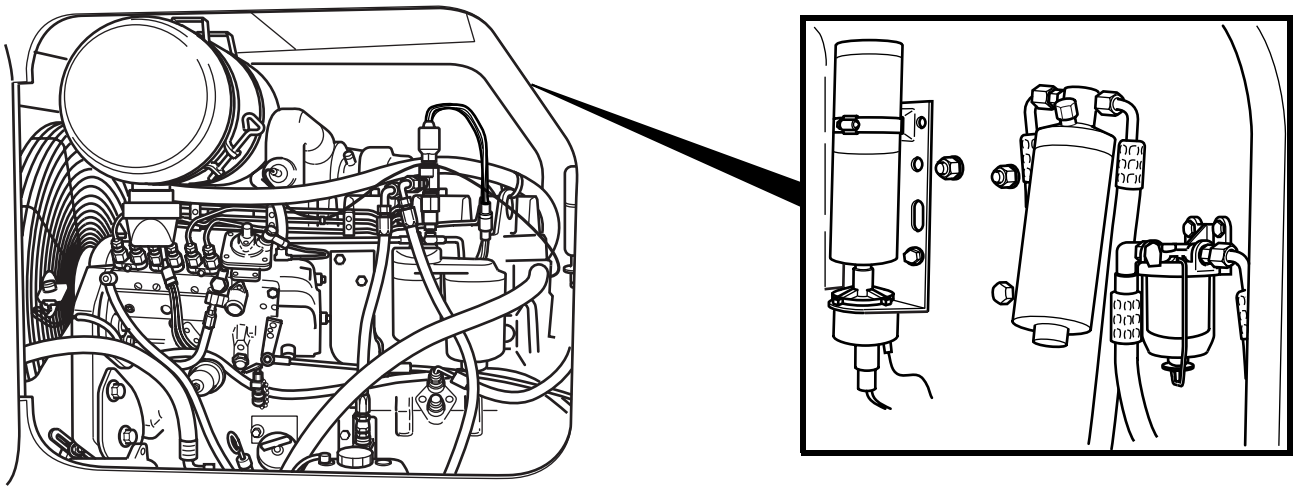
(b) If no coolant is visible in the bottle, add 2 quarts of coolant to bottle and fill radiator with coolant.

3-10. FUEL/WATER SEPARATOR – SERVICE

This Task Covers:

Draining water from engine fuel/water separator.

FUEL/WATER SEPARATOR



RIGHT SIDE OF ENGINE COMPARTMENT

Service.

(1) Look through fuel/water separator glass for presence of water or sediment.

(2) Drain water and sediment from fuel/water separator.

(a) Loosen retaining nut at bottom of sediment bowl.

(b) Pull retaining bracket forward.

(c) Remove sediment bowl and discard contents.

(d) Re-install sediment bowl.

(e) Swing retaining bracket under sediment bowl.

(f) Tighten retaining nut finger tight.

APPENDIX A
REFERENCES

A-1. PUBLICATION INDEXES AND GENERAL REFERENCES

Indexes should be consulted frequently for the latest changes or revisions of references given in this appendix and for new publications relating to material covered in this publication.

a. Military Publication Indexes.

Consolidated Army Publications and Forms Index. . . . . DA 25-30
Functional User's Manual for the Army Maintenance Management System . . . . . DA Pam 738-750

b. General References.

Dictionary of United States Army Terms . . . . . AR 310-25
Authorized Abbreviations and Brevity Codes . . . . . AR 310-50
Military Training Management . . . . . TC 21-5-7
Military Symbols. . . . . FM 21-30

A-2. OTHER PUBLICATIONS

The following publications contain information pertinent to the major item materiel and associated equipment.

a. Camouflage.

Camouflage . . . . . FM 5-20

b. Decontamination.

Chemical, Biological, Radiological, and Nuclear Decontamination . . . . . TM 3-220
Chemical, Biological, Radiological, and Nuclear Defense . . . . . TM 21-40

c. General.

Accident Reporting and Records. . . . . AR 385-40
Basic Cold Weather . . . . . FM 31-70
Manual for Wheeled Vehicle Driver . . . . . FM 21-305
Mountain Operations. . . . . FM 90-6
Northern Operations . . . . . FM 31-71
Desert Operations . . . . . FM 90-3
Operation and Maintenance of Ordnance Material in Cold Weather (0° F to –65° F) . . . . . FM 9-207
Prevention of Motor Vehicle Accidents . . . . . AR 385 55
Procedures for Destruction of Tank Automotive Equipment to Prevent Enemy Use. . . . . TM 750-244-6
The Army Maintenance Management System . . . . . .DA PAM 738-750
Army Logistics Assistance Program. . . . . AR 700-4
Army Logistics Readiness and Sustainability. . . . . AR 700-138
Unit Status Reporting . . . . . AR 220-1

d. First Aid.

First Aid . . . . . FM 4-25.11

e. Maintenance and Repair.

Organizational, Direct Support, and General Support Care, Maintenance and Repair:
Pneumatic Tires and Inner Tubes . . . . . TM 9-2610-200-24
Description, Use, Bonding Techniques and Properties of Adhesives . . . . . TB ORD 103
Inspection, Care, and Maintenance of Antifriction Bearings . . . . . TM 9-214
Materials Used for Cleaning, Preserving, Abrading and Cementing Ordnance Materiel and Related Materiels Including Chemicals . . . . . TM 9-247
Metal Body Repair and Related Operations . . . . . FM 23-2
Operation and Organizational Maintenance Manual for Lead-Acid Storage Batteries . . . . . TM 9-6140-200-14
Organizational, Policies, and Responsibilities for Army Materiel Maintenance Concepts and Policies . . . . . AR 750-1
Use of Antifreeze Solutions and Cleaning Compounds in Engine Cooling System . . . . . TB 750-651
Welding Theory and Application . . . . . TM 9-237
Color, Marking, and Camouflage Painting of Military Vehicles, Construction Equipment, and Materials Handling Equipment . . . . . TB 43-0209
Standards of Criteria for Technical Inspection and Classification of Tires . . . . . TM 9-2610-201-14
Safety Inspection and Testing of Lifting Devices . . . . . TB 43-0142

f. Shipment and Limited Storage.

Color, Marking, and Preparation of Equipment for Shipment of Army Materiel . . . . . TB 43-0209
Organizational, Direct Support, and General Support Preservation and Packing of Military Supplies and Equipment . . . . . TM 38-230-1 & 2
Preservation of USAMECOM Mechanical Equipment for Shipment and Storage . . . . . TB 740-97-2
Preservation and Packing of Military Supplies and Equipment . . . . . TM 38-230-1 & 2
Preservation, Packaging, Packing and Marking Materials, Supplies, and Equipment Used by the Army . . . . . SB 38-100
Shipment and Limited Storage MIL-V-62038
Storage and Serviceability Standard: Tracked Vehicles, Wheeled Vehicles, and Component Parts . . . . . SB 40-98-1
Storage and Supply Activities: Covered and Open Storage . . . . . SB 740-1
The Army Maintenance Management Systems (TAMMS) . . . . . DA PAM 738-750
Certification of Military Equipment for Transport in MAC/CRAF Aircraft . . . . . TB 55-45
Standards for Overseas Shipment or Domestic Issue of Special Purpose Vehicles . . . . . TB 2300-281-35
Transportability Guidance for Application of Blocking, Bracing and Tiedown Materiels for Rail Transport . . . . . TM 55-2200-001-12
Transportation Reference Data . . . . . FM 55-15

APPENDIX B
COMPONENTS OF END ITEM (COEI) AND BASIC ISSUE ITEMS (BII) LIST

Section I. INTRODUCTION

B-1. SCOPE

This appendix lists COEI and BII for the ATLAS to help you inventory items required for safe and efficient operation.

B-2. GENERAL

Components of End Item (COEI). This list is for information purposes only, and is not authority for requisition of replacements. These items are part of the ATLAS. As part of the end item, these items must be with the end item whenever it is issued or transferred between property accounts. Items of COEI are removed and separately packaged for transportation or shipment only when necessary. Illustrations are furnished to help you find and identify the items.

Basic Issue Items (BII). These essential items are required to place the ATLAS vehicles in operation, to operate them, and to do emergency repairs. Although shipped separately packaged, BII must be with the ATLAS during operation and whenever it is transferred between property accounts. Listing these items is your authority to request/requisition them for replacement based on authorization of the end item by the TOE/MTOE. Illustrations are furnished to help you find and identify the items.

B-3. EXPLANATION OF COLUMNS IN THE COEI LIST AND BII LISTS

a. Column (1), Illus Number. This column gives you the number of the item illustrated.

b. Column (2), National Stock Number. This column identifies the stock number of the item to be used for requisitioning purposes.

c. Column (3), Description CAGEC and Part Number. This column identifies the Federal item name (in all capital letters) followed by a minimum description when needed. The last line below the description is the Commercial and Government Entity code (CAGEC) (in parentheses) and the part number.

d. Column (4) Usable On Code. When applicable, gives you a code if the item you need is not the same for different models of equipment. These codes are identified below:

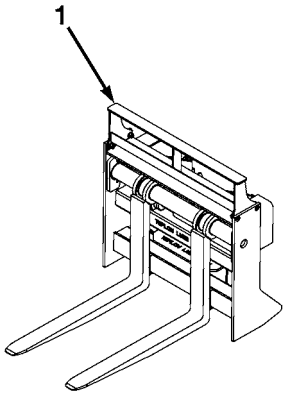
Code	Used On
LAS	All Terrain Lifter Army System (ATLAS)

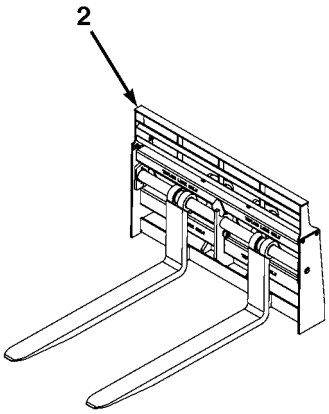
e. Column (5), U/I (Unit of Measure). Unit of Issue (U/I) indicates the physical measurement or count of the item as issued per the National Stock Number shown in column (2).

f. Column (6), Qty Rqd. This column indicates the quantity required.

Section II. COMPONENTS OF END ITEM

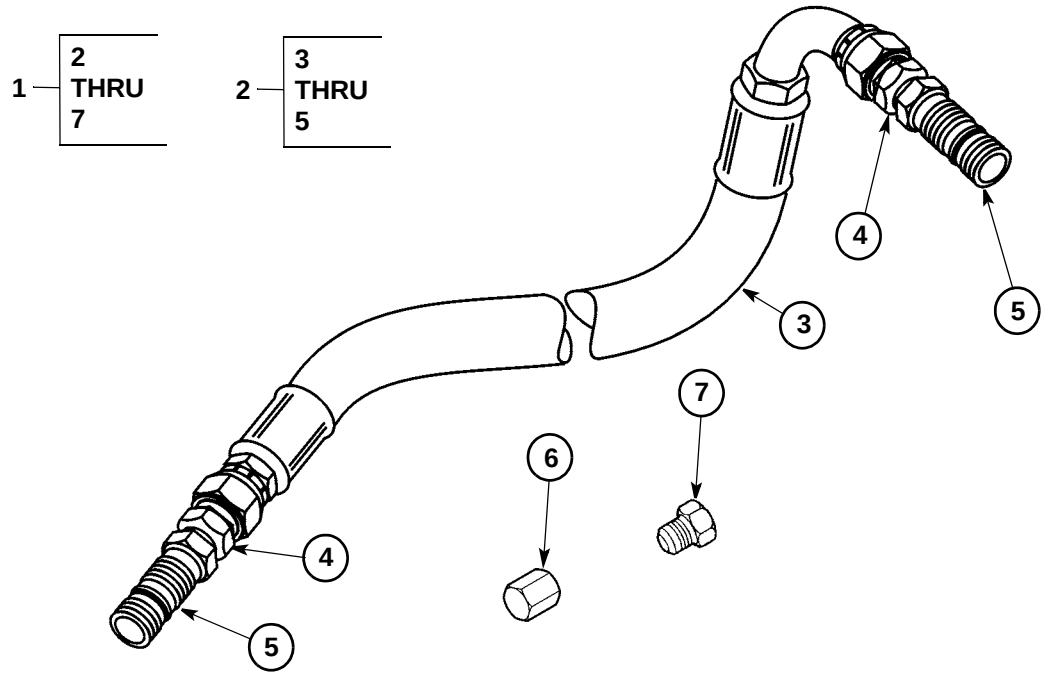
(1) Illus Number	(2) National Stock Number	(3) Description CAGEC and Part Number	(4) Usable on Code	(5) U/I	(6) Qty Rqd
1	3930-01-454-2131	Carriage, 6K 6615204/(1YHH8)	LAS	ea	1
2	3930-01-529-6382	Carriage, 10K 6615214/(1YHH8)	LAS	ea	1



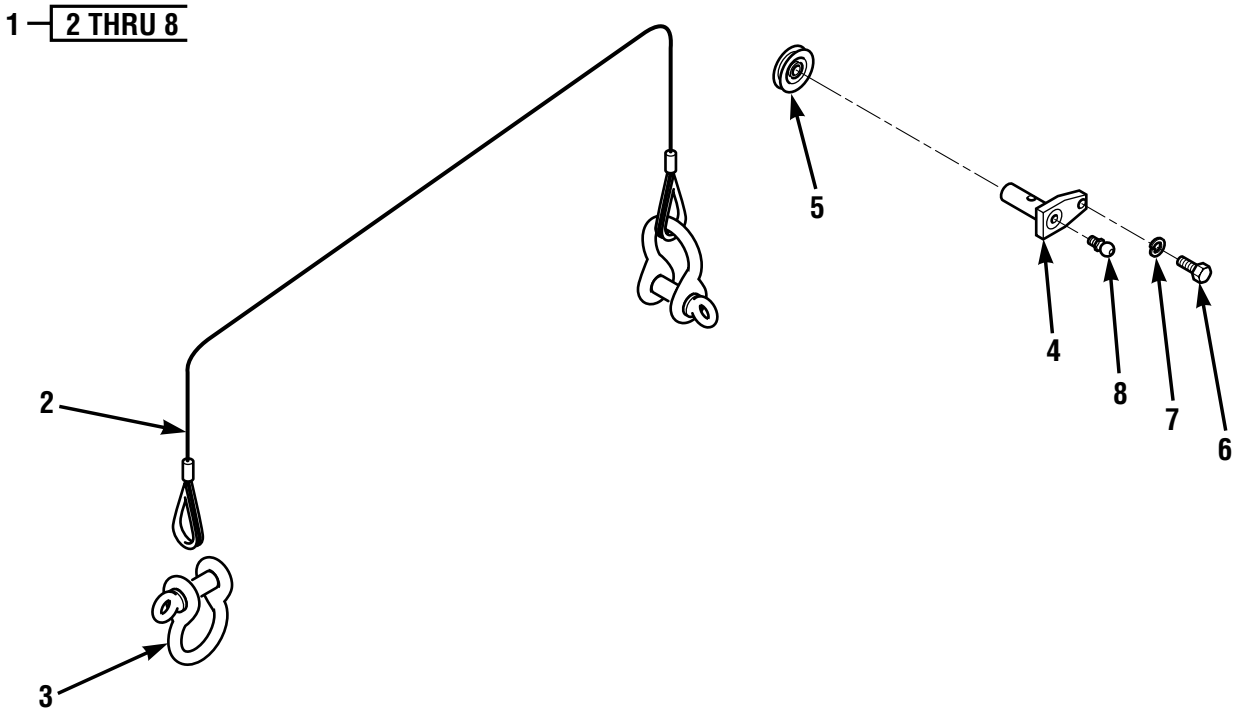


Section III. BASIC ISSUE ITEMS

(1) Illus Number	(2) National Stock Number	(3) Description CAGEC and Part Number	(4) Usable on Code	(5) U/I	(6) Qty Rqd
1	4720-01-502-4980	Emergency Boom Lift and Retract, Raise and Lower Kit (1YHHB) 6622013 (Also used when towing vehicle)	LAS	ea	1
2		Hose Assembly (1YHH8) 2716022	LAS	ea	1
3		Hose Assembly (1YHH8) 2716002	LAS	ea	1
4	4730-00-797-6567	Coupler, Tube (1YHH8) 8430045	LAS	ea	2
5	4730-00-786-2247	Connector (1YHH8) 8760015	LAS	ea	2
6	4730-00-585-6565	Cap, Tube (1YHH8) 8760489	LAS	ea	1
7	4730-00-762-1239	Plug (1YHH8) 8770035	LAS	ea	1



(1) Illus Number	(2) National Stock Number	(3) Description CAGEC and Part Number	(4) Usable on Code	(5) U/I	(6) Qty Rqd
1	2590-01-442-7346	Counterweight Removal Assembly (3Y949) 6615484	LAS	ea	1
2		Pendant with Shackle, Kit (3Y949) 6621953	LAS	ea	1
3	4030-01-440-7985	Shackle, Anchor (12128) M656A	LAS	ea	2
4	5315-01-449-5031	Pin, Sheave (3Y949) 6618392	LAS	ea	4
5	3020-01-441-0818	Sheave (3Y949) 8962605	LAS	ea	4
6	5305-00-543-4372	Screw, Cap, Hex, Hd (80204) B1821BH038C075N	LAS	ea	4
7	5310-00-637-9541	Washer, Lock (96906) MS35338-46	LAS	ea	4
8	4730-00-050-4208	Fitting, Lubrication (96906) MS15003-1	LAS	ea	4



APPENDIX C
ADDITIONAL AUTHORIZATION LIST

Section I. INTRODUCTION

C-1. SCOPE

This appendix lists additional items you are authorized for support of the ATLAS.

C-2. GENERAL

This list identifies items that do not have to accompany the ATLAS and do not have to be turned in with it. These items are all authorized to you by CTA, MTOE, TDA, or JTA.

C-3. EXPLANATION OF LISTING

National stock numbers, descriptions, and quantities are provided to help you identify and request the additional items you required to support this equipment.

C-4. EXPLANATION OF COLUMNS

a. Column (1), National Stock Number. This column identifies the stock number of the item to be used for requisitioning purposes.

b. Column (2), Description CAGEC and Part Number. This column identifies the Federal item name (in all capital letters) followed by a minimum description when needed. The last line below the description is the Commercial and Government Entity Code (CAGEC) (in parentheses) and the part number.

c. Column (3), Usable on Code. This column identifies the usable on code of the item.

d. Column (4), U/M (Unit of Measure). This column indicates how the item is issued for the National Stock Number shown in column one.

e. Column (5), Qty Auth. This column indicates the quantity authorized for each forklift.

Section II. ADDITIONAL AUTHORIZATION LIST

(1) National Stock Number	(2) Description CAGEC and Part Number	(3) Usable on Code	(4) U/M	(5) Qty Auth
4210-00-115-8956	Fire Extinguisher, Halon 1211, 5 lb (98752) IRA 4210-031 5 lb		ea	1
7520-00-559-9618	Case, Maintenance (81349) MIL-C-11743		ea	1
6545-00-919-6650	First Aid Kit, General		ea	1
2835-01-078-2081	Sling, Nylon (91796) 4-8FTX2IN		ea	2

APPENDIX D
EXPENDABLE/DURABLE SUPPLIES AND MATERIALS LIST

Section I. INTRODUCTION

D-1. SCOPE

This appendix lists the expendable consumable maintenance supplies you will need to operate and maintain the ATLAS. This listing is for informational purposes only and is not authority to requisition the listed items. These items are authorized to you by CTA 50-970, Expendable/Durable Items.

D-2. EXPLANATION OF COLUMNS

a. Column (1), Item Number. This number is assigned to the entry in the listing and is referenced in the narrative instructions to identify the material (e.g., "Use cleaning compound, Item 5, Appendix C").

b. Column (2), Level. This column identifies the lowest level of maintenance that requires the listed item.

C – Operator/Crew

O – Organizational Maintenance

F – Direct Support Maintenance

H – General Support Maintenance

c. Column (3), National Stock Number. This is the National Stock Number assigned to the item; use it to request or requisition the item.

d. Column (4), Description. Indicates the Federal item name, and, if required, a description to identify the item. The last line for each item indicates the part number followed by Commercial And Government Entity (CAGE) Code in parentheses.

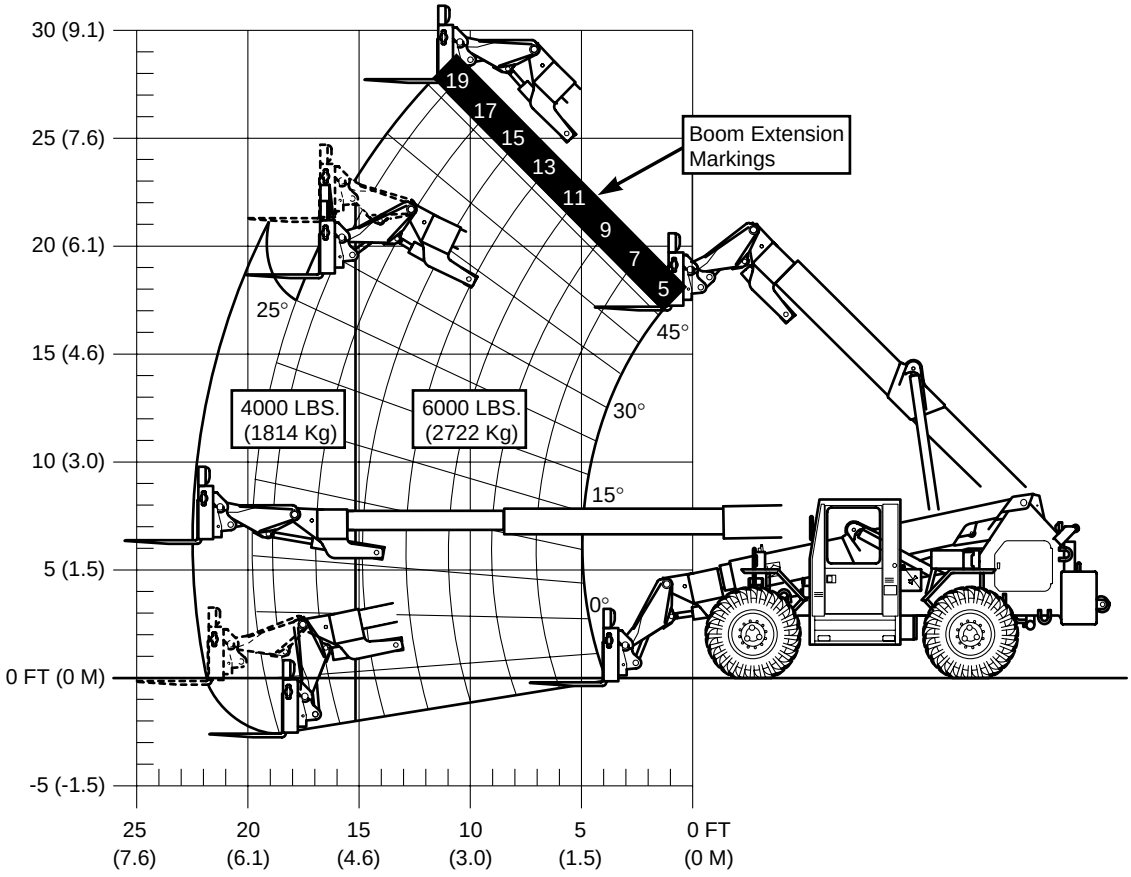
e. Column (5), Unit of Measure U/M. Indicates the measure used in performing the actual maintenance function. This measure is expressed by two-character alphabetical abbreviations (e.g., ea, in, pr). If the unit of measure differs from the unit of issue, requisition the lowest unit of issue that will satisfy your requirements.

Section II. EXPENDABLE/DURABLE SUPPLIES AND MATERIALS LIST (CON'T)

(1) Item Number	(2) Level	(3) National Stock Number	(4) Description	(5) U/M
2	C		Antifreeze, Permanent, Ethylene Glycol, Inhibited MIL-A-46153 (81349)	
		6850-00-181-7933	5 Gallon Can	gal
		6850-01-441-3223	55 Gallon Drum	gal
2.1	C		Antifreeze, Permanent, Type: Arctic Grade (58536) A-A-52624	
		6850-01-441-3248	55 Gallon Drum	gal
2.2	C		Cleaning Compound, Solvent P-D-680 Type III (81348)	
		6850-01-474-2318	1 Gallon Container	gal
		6850-01-474-2320	5 Gallon Container	gal
		6850-01-474-2321	55 Gallon Drum	gal
2.3	C		Fuel, Turbine, Aviation	
		9130-01-031-5816	(81349) MIL T83133 GR JP8	gal
2.4	C		Grease: Automotive and Artillery, GAA	
		9150-01-197-7688	M-10924-A (81349)	
			1-1/4 Ounce Tube	oz
		9150-01-197-7693	M-10924-B (81349)	
			14 Ounce Cartridge	oz
		9150-01-197-7690	M-10924-C (81349)	
			1-3/4 Pound Can	lb
		9150-01-197-7692	M-10924-E (81349)	
			35 Pound Can	lb
2.5	O		Lubricant, Teflon Dry, 8526415 (IYHH8)	
		3930-01-512-2281	1 Spray Can	oz
3	C		Oil, Fuel, Diesel, DF-2 Regular VVF800 (81349)	
		9140-00-286-5295	5 Gallon Can	gal
		9140-00-286-5296	55 Gallon Drum	gal
		9140-00-286-5294	Bulk	gal
4	C		Oil, Fuel, Diesel, DF-1 Winter VVF800 (81349)	
		9140-00-286-5287	5 Gallon Can	gal
		9140-00-286-5288	55 Gallon Drum	gal
		9140-00-286-5286	Bulk	gal
5	C		Oil, Fuel, Diesel, DF-A Arctic WF800 (81349)	
		9140-00-286-5282	5 Gallon Can	gal
		9140-00-286-5284	55 Gallon Drum	gal
		9140-00-286-5283	Bulk	gal
6	C		Oil, Lubricating, Engine Arctic OEA, MIL-L-46167 (81349)	
		9150-00-402-4478	1 Quart Can	qt
		9150-00-402-2372	5 Gallon Can	gal
		9150-00-491-7197	55 Gallon Drum	gal

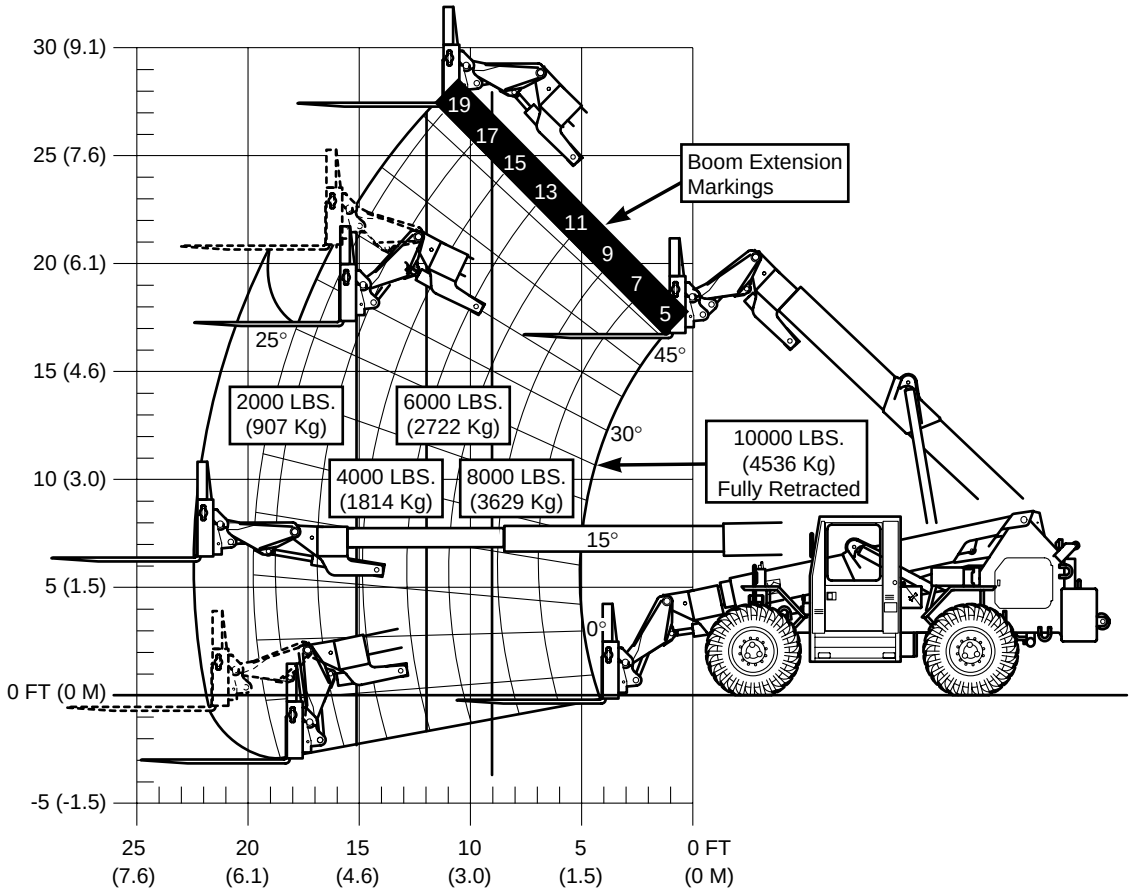
(1) Item Number	(2) Level	(3) National Stock Number	(4) Description	(5) U/M
7	C		Oil, Lubricating, Engine OE/HDO-15/40, MIL-L-2104 (81349)	
		9150-01-152-4117	1 Quart Can	qt
		9150-01-152-4118	5 Gallon Can	gal
		9150-01-152-4119	55 Gallon Drum	gal
8	C		Oil, Lubricating, Transmission/Hydraulic OE/HDO-10 MIL-L-2104 (81349)	
		9150-00-189-6727	1 Quart Can	qt
		9150-00-191-2772	55 Gallon Drum	gal
9	C	7920-00-205-3570	Rags, Wiping (64067)	lb

APPENDIX E
LOAD RATING CHART



6000 LB (2722 KG) CARRIAGE

LOAD RATING CHART (CONT)



10,000 LB (4536 Kg) CARRIAGE

APPENDIX F
TRANSPORTABILITY INSTRUCTIONS

SECTION I. INTRODUCTION

F-1. GENERAL

a. Purpose and Scope.

This appendix is for transportation officers and other personnel responsible for safe transportation of the ATLAS. It provides data for planning and executing movement of the ATLAS worldwide. Included are physical characteristics of the ATLAS, safety precautions, technical data on transport modes, and lifting and tiedown procedures.

The major dimensions and weights given in this manual are US customary and equivalent SI (metric) units. Approximate values appear in parentheses following the customary-unit value.

Transport modes are presented in F-4. Modes of Transportation.

b. Related Publications.

Additional information on transport procedures can be found in:

FM 55-65, Strategic Deployment by Surface Transportation.
TB 9-2300-281-35, Standards for Overseas Shipment or Domestic Issue of Special Purpose Equipment.
TM 38-250/AFR 71-4, Preparation of Hazardous Materials for Military Air Shipment.

c. Definitions.

Technical terms that may be helpful while using this appendix are:

(1) Axle Limits. A load limit set by highway officials or designers of ship decks and aircraft as the maximum axle (or group of axles) weight that can be supported.

(2) Center of Gravity (CG). The balance point of a suspended item. The ATLAS counterweight is used to shift CG to the rear. CG location is indicated by a symbol stencilled on the vehicle.

(3) Curb Weight (CW). Total weight of operational ATLAS including fuel, all system fluids, and on-vehicle basic issue items (BII). CW does not include crew weight, which in this case is less than 1 percent of the gross vehicle weight.

(4) Gross Vehicle Weight (GVW). CW plus payload. For transport purposes, a forklift has no payload. Therefore the GVW equals the CW.

(5) Safe Working load (SWL). The SWL is the maximum recommended load that should be exerted on an item. SWL is also referred to as “working load,” “working load limit,” or “resultant safe working load.” Such rated load values are for in-line pull.

(6) Loading Restraint Factors (LRF). The LRF, given in this appendix for the surface and air modes, are considered to be the “G” factors that can be expected in military transport.

F-2. SAFETY

a. General. Even though the ATLAS has no special hazardous or dangerous characteristics during exposure to normal transportation environments, several general safety considerations and precautions are important.

(1) Check the entire vehicle to be sure loose items are properly secured.

(2) Have fire extinguishers readily available when operating the ATLAS.

(3) Make sure only qualified personnel operate the ATLAS.

(4) Never permit riders. This is a one-person machine.

(5) Do not leave the ATLAS unattended while the engine is running.

(6) Do not allow the ATLAS to exceed 3 miles per hour during loading and unloading operations.

(7) Do not drive the ATLAS on public highways without the appropriate safety equipment.

(8) Adhere to all local, state, federal, and host-nation safety laws and regulations applying to commercial carriers.

b. Hazardous Material Considerations. The basic ATLAS does not contain hazardous material. Regulations or transportation procedures covered diesel-fuel-powered vehicles will apply.

F-3. EQUIPMENT DESCRIPTION

a. General.

(1) The ATLAS is designed for loading and unloading munitions and other palletized items from transport vehicles and containers. The ATLAS is also designed for use as a standard rough terrain forklift. The ATLAS can handle boxes, palletized ammunition loads, and other palletized items from transport vehicles and containers. The vehicle frame can be tilted 9 degrees to left or right, which allows vehicle to be level when traversing a sideslope. The attachment can be raised to a nearly horizontal position for loading and unloading munitions. The forks tilt, level, and sideshift to maneuver loads. With 6K carriage, lifts loads of 6,000 lbs to a height of 28 ft. With 10K carriage, lifts loads of 4,000 lbs to a height of 27.5 ft, and 10,000 lbs to a height of 17 ft, and can tow other vehicles weighing 33,500 pounds or less. The operator can select one of three steering modes: two wheel, four wheel, and crab wheel. The ATLAS is all-weather operational, and can ford in up to 36 inches of water. The ATLAS has a maximum speed of 23 mph over level ground with evenly distributed load.

b. Technical Data. The following selected characteristics and data apply to the ATLAS. More characteristics and data can be found in Table 1-1, Equipment Data in Chapter 1 of this TM and in Figures F-1 through F-8.

Vehicle Operational Weights:
- With 6K carriage . . . . . 31,300 lb
- With 10K carriage . . . . . 32,600 lb
- Roading (both carriages) . . . . . 33,500 lb

Boom Assembly Weight . . . . . 5,165 lb

Max Length in Carry Position:
- With 6K carriage . . . . . 324.2 in.
- With 10K carriage . . . . . 356.3 in.
- Roading . . . . . 356.3 in.

Width . . . . . 100.2 in.

Max Height . . . . . 107 in.

Track Width (Tread) . . . . . 80.3 in

Max lift height with 6K carriage:
- 6,000 lb (max height) . . . . . 27 ft, 11.5 in.

Max lift height with 10K carriage:
- 6,000 lb (max height) . . . . . 27 ft, 8 in.
- 8,000 lb . . . . . 24 ft, 9.5 in.
- 10,000 lb . . . . . 16 ft, 11 in.

Boom Lift Angle (Maximum) . . . . . 45 degrees

Ground Clearance . . . . . 15.2 in. min

Curb to Curb Turning Circle (Diameter) . . . . . 27 ft, 10 in.

Frame Oscillation . . . . . 9 degrees to the left or right

c. Reduced Configuration. The ATLAS is configured as a single unit (with the counterweight installed and 6K carriage stowed on the 10K carriage) for highway transport, rail transport, and air transport on C-141 and C-5 aircraft. For transport on C-130 aircraft, the following are required:

(1) Both the 6K and 10K carriages shall be removed from the ATLAS and placed on a 463L pallet. Refer to paragraph 2-12. 6K/10K Fork Carriage Removal/Installation.

(2) The counterweight shall be removed from the ATLAS and placed on the same 463L pallet. Refer to paragraph 2-14. Counterweights Removal/Installation.

F-4. MODES OF TRANSPORTATION

a. Highway.

(1) The ATLAS is self-propelled at speeds up to 23 mph.

(2) The ATLAS is furnished with a pintle hook in the rear of the vehicle conforming to MS51118 for towing speeds up to 15 mph. Provision for attachment of safety chains are provided in accordance with SAE J697. The ATLAS is equipped with two vehicular towing lugs at the rear of the vehicle conforming to MS500004 which provide clearance to connect a towbar conforming to MS500048. The towing procedures are found in Paragraph 2-31.

(3) The ATLAS is capable of being transported over the highway on standard military and commercial trailers. Refer to Figure F-9.

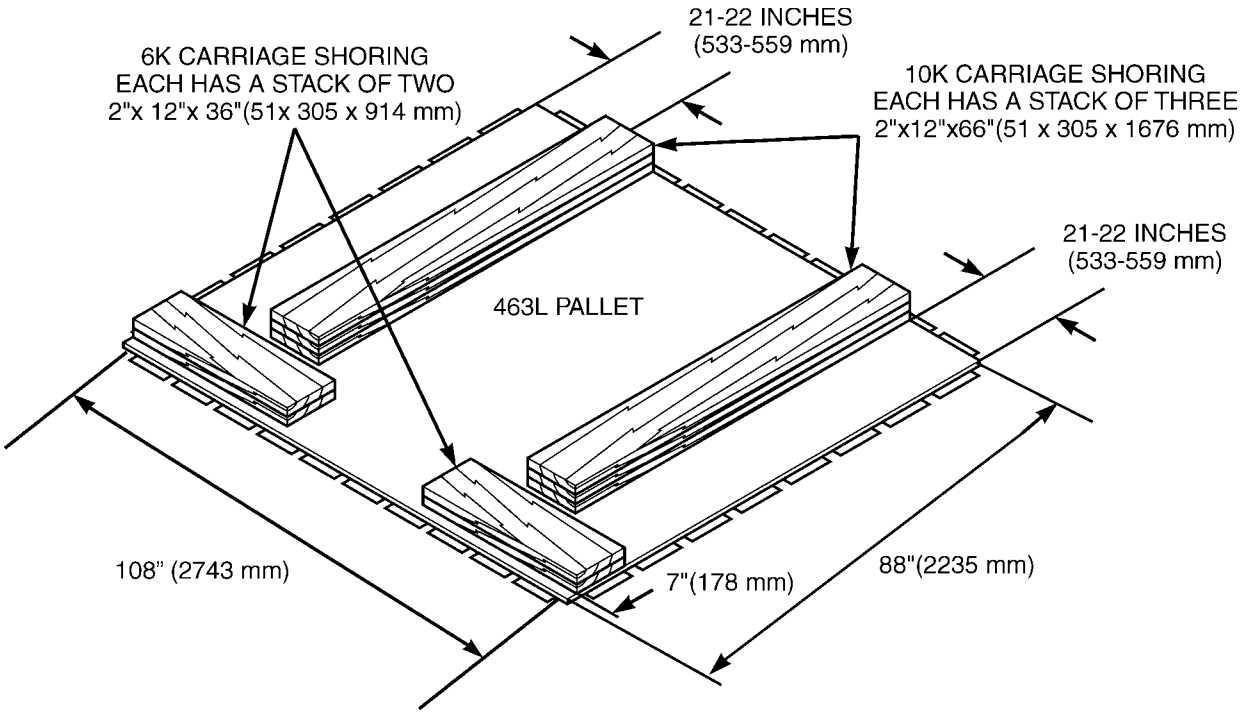
b. Rail. The ATLAS is rail-transportable in CONUS and NATO countries without restriction. When loaded on a 50 inch high rail car, the ATLAS has a dimensional profile within the ARR and GIC outlines as prescribed in MIL-STD-1366. Refer to Figure F-10. The ATLAS withstands the shock loads resulting from rail impact (when tested in accordance with MIL-STD-810) without failure, damage, or permanent deformation. Refer to Figure F-10.

c. Oceans and Waterways. The ATLAS is transportable by breakbulk cargo ships, roll-on/roll-off (RORO) ships: C-8 and larger. Lighter aboard ship (LASH); barge carrying ships (SEABEE); Lighter, Amphibious, resupply, cargo (IARC)-LX, and larger lighter vessels; landing craft utility (LCU); landing craft mechanized (LCM); and Army barges and lighters in accordance with MIL-STD-1366. The ATLAS will withstand without damage, the shock, rolling (up to 15 degrees), and pitching (up to 10 degrees) normally experienced in marine transportation on the deck or in the hold of a cargo vessel.

d. Air. The ATLAS meets the requirements of MIL-STD-1791 for transport on C-130, C-141, and C-5 aircraft. The ATLAS can be directly driven onto C-141 and C-5 aircraft. Refer to Figure F-11. and Figure F-12. The ATLAS can be reconfigured for transport on C-130 aircraft (maximum axle loading of 13,000 lbs.) by two personnel without the use of special tools by removing the counterweight and carriages. Refer to Figure F-13.

F-5. LOADING AND UNLOADING THE ATLAS ON BOARD A C-130 AIRCRAFT

a. Loading the ATLAS.



(1) Place six pieces of lumber measuring 2 x 12 x 66 inches (51 x 305 x 1676 mm) for shoring, stacked three high in two rows on 463L pallet as shown. This shoring will be used to shore the counterweight and 10K carriage.

(2) Place four pieces of lumber measuring 2 x 12 x 36 inches (51 x 305 x 914 mm) for shoring, stacked two high in two rows on the end of the 463L pallet. This shoring will be used to shore the 6K carriage.

NOTE

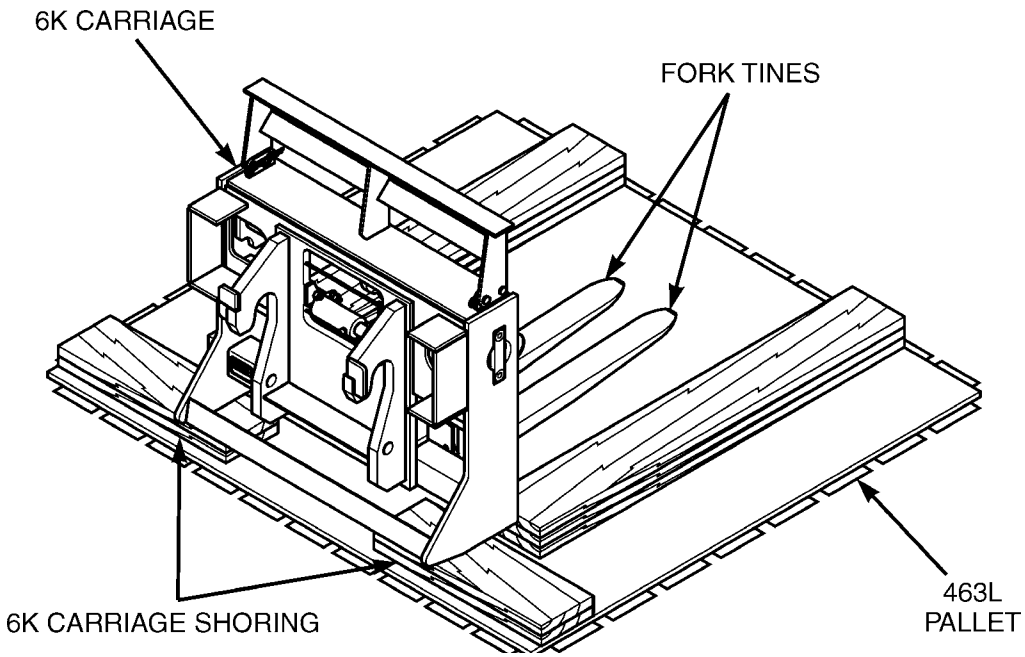
Ensure that the fork tines of the 6K carriage are in the center and fully closed position.

(3) Remove the ATLAS 6K carriage and install the 10K carriage (Para 2-12).

(4) Using the ATLAS with 10K carriage installed, pick the 6K carriage up with 6K tines facing away from cab.

(5) Drive the ATLAS to the 463L pallet, approaching from the 108 inch side of the pallet where the 6K shoring is stacked.

F-5. LOADING AND UNLOADING THE ATLAS ON BOARD A C-130 AIRCRAFT (CONT)



(6) Position 6K carriage over the 463L pallet with the back end of carriage at outer edge of pallet.

NOTE

- Carriage should not protrude past the edge of the 463L pallet.
- Carriage should be centered between left and right sides of 463L pallet.

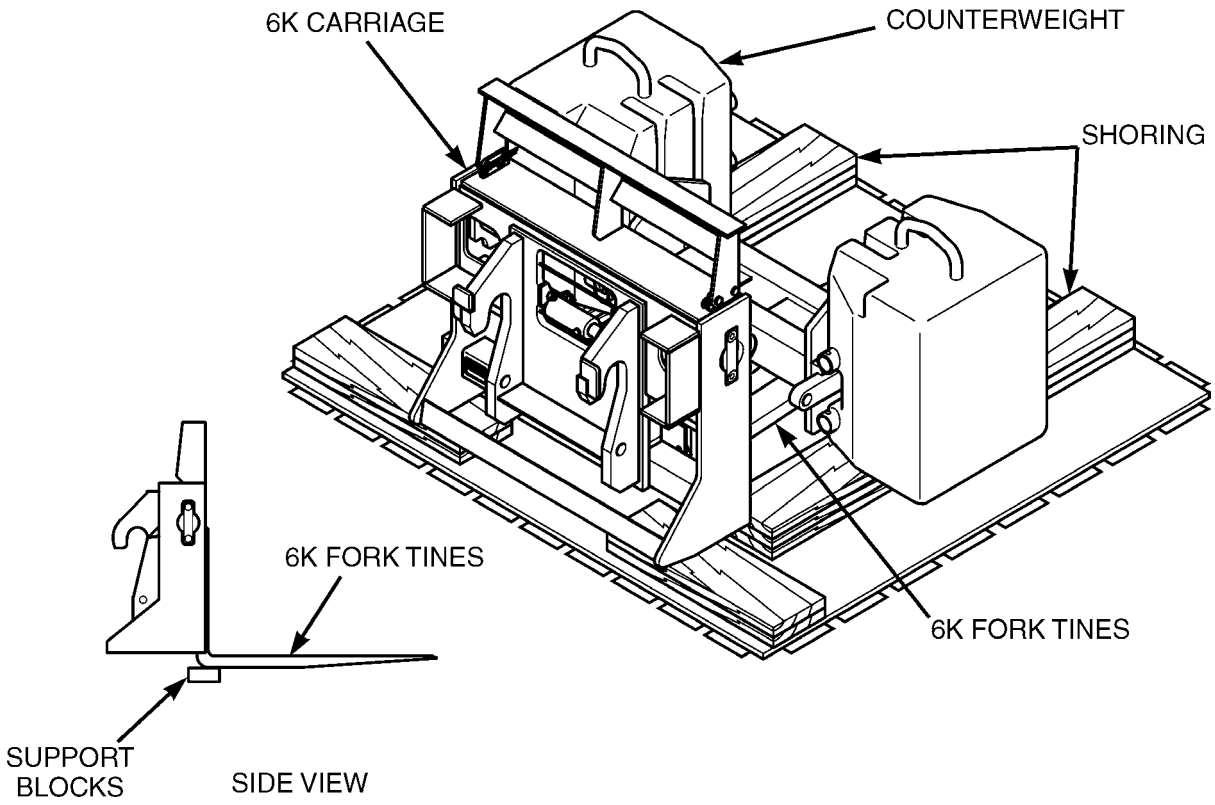
(7) Lower the 6K carriage onto the shoring and 463L pallet and drive ATLAS away from pallet.

(8) Remove the ATLAS counterweight assembly (Para 2-14).

WARNING

- Use extreme care when lifting counterweight with forklift. Counterweights weigh 5800 lbs (2633.2 kg) and its center of gravity (CG) is off center. Never allow forks to tip forward. Always tie counterweight lifting eyes to the lifting forklift. Counterweight must be handled using another 10K ATLAS/10K carriage and lifted through lifting eyes located at the top of the counterweight. Keep hands or fingers out of holes for counterweight pins. Failure to comply could result in serious injury or death to personnel.
- When the ATLAS is being operated without counterweight, care must be taken to avoid tipping the vehicle over. Boom extension must be kept at a minimum. Failure to comply could result in serious injury or death to personnel.

(9) Using the ATLAS with 10K carriage installed, pick the counterweight up from the front side (side without pintle hook) through the lifting eyes.



(10) Drive the ATLAS to the 463L pallet, approaching from the 108 inch side of the pallet where the counterweight and 10K shoring is stacked.

(11) Position counterweight over the 463L pallet with the counterweight centered fore and aft.

NOTE

- Counterweight should also be centered between left and right sides of 463L pallet.
- Space must be allowed to position 10K fork tines between outer edge of 6K fork tines and inner edge of counterweight blocks.

(12) Lower the counterweight onto the shoring and 463L pallet and drive ATLAS away from pallet to the aircraft.

(13) Place support blocks under the heels of the 6K fork tines to prevent tipping during transport.

(14) Using the ATLAS with 10K carriage installed, approach the 463L pallet (with counterweight and 6K carriage) from the side opposite the shored 6K carriage.

(15) Using the ATLAS with 10K carriage installed, pick up the 463L pallet (with counterweight and 6K carriage).

F-5. LOADING AND UNLOADING THE ATLAS ON BOARD A C-130 AIRCRAFT (CONT)

NOTE

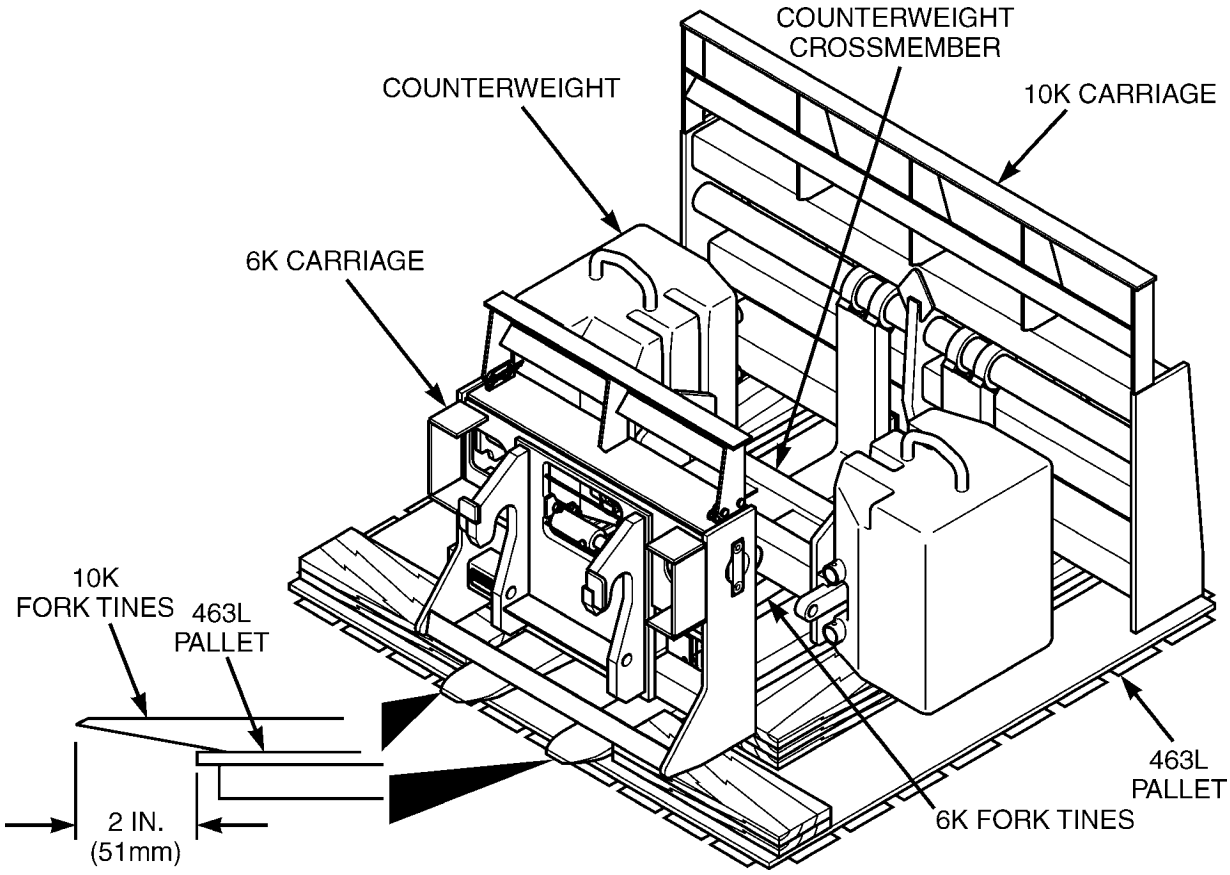
The 463L pallet is compatible with the roller system of the C-130 aircraft.

(16.0) Place a wheel chock or other shoring material at rear of rear ramp of aircraft to temporarily support 463L pallet to allow 10K forks to be withdrawn from under pallet.

(16) With the rear ramp of the C-130 in horizontal position, place 463L pallet on rear ramp with the lateral (108 inch) side perpendicular to aircraft.

(16.1) Partially withdraw 10K forks from under pallet to tapered portion of forks. Raise forks sufficiently to allow removal of chock or shoring material. Remove chock or shoring material. Completely lower pallet to ramp and completely withdraw 10K forks.

(17) Remove support blocks from under heels of 6K fork tines.



(18) Align the 10K carriage for positioning on the 463L pallet with the fork tines extending through the counterweight crossmember and outside the 6K carriage fork tines.

(19)

(20) Disconnect hydraulic couplings of the 10K carriage (Para 2-12).

(21)

(22) Position 10K fork tines to extend past the edge of the 463L pallet by 2 inches (50.8 mm) and lower the 10K carriage onto the shoring and 463L pallet.

(23) Remove the 10K carriage from the ATLAS (Para 2-12).

NOTE

- The ATLAS boom extension may be used to roll 463L pallet forward off the ramp and onto the aircraft where loading personnel can roll the pallet to the far end of the aircraft.
- If the C-130 aircraft is not level, the 463L pallet shall be attached to the winch and guided by the winch to the front of the aircraft.

(24) Roll 463L pallet (with counterweight and both carriages) toward front of the C-130.

NOTE

The rear of the 463L pallet should not cover the 9th row of tiedown rings on the floor of the C-130 aircraft.

(25) Position the front end of the 463L pallet at fuselage station FS317 (approximate location of the 4th row of tiedown rings on the floor.)

(26) Lock the 463L pallet into position using the C-130 pallet rail locking system.

CAUTION

Do not allow chaining to scratch, nick, or dent carriage fork shaft or side shift cylinder rods. Failure to follow this caution will result in equipment damage.

(27) Restrain the 6K carriage, refer to Figure F-13.

(a) Chain the 6K carriage around the hole in the left carriage restraint bracket to the floor tiedown ring at 3C, and around the hole in the right carriage restraint bracket to the floor tiedown ring at 3E.

(b) Chain the 6K carriage around the right side plate to the 6th ring on the right side restraining rail assembly (6A), and around the left side plate to the 6th ring on the left side restraining rail assembly (6A).

(28) Restrain the counterweight.

(a) Attach a chain at the 3rd ring on the left side of the restraining rail assembly (3G), through the counterweight lifting eye, and to the 9th ring on the left side of the restraining rail assembly (9G).

(b) Attach a chain at the 3rd ring on the right side of the restraining rail assembly (3A), through the counterweight lifting eye, and to the 9th ring on the right side of the restraining rail assembly (9A).

(29) Restrain the 10K carriage.

(a) Attach a chain to the left and right side backrests and to the 5th tiedown ring of the restraining rail assembly (5G and 5A) on the left and right sides.

F-5. LOADING AND UNLOADING THE ATLAS ON BOARD A C-130 AIRCRAFT (CONT)

(b) Place a chain around the left side of the top backrest to ring (10C) on the floor of the aircraft. The chains should cross each other.

(c) Place a chain around the right side of the top backrest and secure chain to ring (10E) on the floor of the aircraft.

CAUTION

Do not allow chaining to scratch, nick or dent carriage fork shaft or side shift cylinder rods. Failure to follow this caution will result in equipment damage.

(d) If damage of the 10K backrest is noted, chain the carriage around the side plate beneath the sideshift bar.

(30) Extend or retract the boom to the location indicated on the boom for the C-130 transport.

(31) Extend the attachment cylinder until the attachment is fully raised.

(32) Open the top window portion of the operator's cab door and restrain in the open position to allow the operator to exit the ATLAS in the C-130 aircraft.

CAUTION

Adjust boom angle to horizontal before backing up aircraft ramp and carefully adjust boom angle, as required, to assure that a) front of boom does not make contact with either ramp below or aircraft door above, and b) to assure that rear top of boom does not make contact with aircraft door above.

NOTE

The ATLAS shall be backed up toward the right side of the aircraft to allow a safety aisle on the left side of the aircraft.

(33) Back the ATLAS onto the C-130 aircraft until the rear axle is at fuselage station FS530 of the cargo area and the front axle is at fuselage station FS654.

(34) Lower the boom until the lift cylinder bottoms out and the boom is at its lowest position.

(35) Shut off the engine, move the parking brake switch to ON position, and place the transmission select lever in neutral and switch auxiliary fuel shut-off switch to OFF position.

(36) Refer to Figure F-13. and tie down the ATLAS.

(37) Place sleeper shoring under both axles of the vehicle such that the shoring does not bear any of the weight initially, but the shoring will absorb any bounce of the ATLAS during flight.

(38) In the area where the underside of boom is closest to top of frame, place a 13-1/8 inch thick piece (or stack) of sleeper shoring between top frame plate of the ATLAS and the boom to absorb any vibration of the boom that may occur during flight. Secure sleeper shoring in place.

b. Unloading the ATLAS.

(1) Untie the ATLAS and remove sleeper shoring.

(2) Start the engine, release the parking brake, and place the transmission select lever in forward. Speed range '1' should also be selected.

(3) Drive the ATLAS out of the cargo hold.

(4) Remove chains from carriage and counterweight.

(5) Unlock the 463L pallet from the C-130 pallet rail locking system.

(6) Roll 463L pallet (with counterweight and carriages) toward ramp of the C-130.

(7) With the rear ramp of the C-130 in horizontal position, place 463L pallet on rear ramp with lateral (108 inch) side perpendicular to aircraft.

(8) Drive the ATLAS to the 463L pallet, approaching from the side of the pallet where the 10K carriage is shored.

(9) Install the 10K carriage on the ATLAS (Para 2-12) and back up the ATLAS.

WARNING

When the ATLAS is being operated without counterweight, care must be taken to avoid tipping the vehicle over. Boom extension must be kept at a minimum. Failure to comply could result in serious injury or death to personnel.

(10) Using the ATLAS with 10K carriage installed, pick up the 463L pallet (with counterweight and 6K carriage).

(11) Position 463L pallet on stable level ground in suitable area.

(12) Drive the ATLAS to the 463L pallet, approaching from the 108 inch side of the pallet where the counterweight and 10K shoring is stacked.

WARNING

Counterweight assembly weighs 5,800 lbs. Keep out from underneath counterweight assembly. Do not stick fingers or hands in holes for counterweight pins. Failure to comply could result in injury or death to personnel.

(13) Using the ATLAS with 10K carriage installed, pick the counterweight up through the lifting eyes, and place on stable level ground in suitable area.

(14) Install counterweight assembly on the ATLAS (Para 2-14).

(15) Drive the ATLAS toward the 463L pallet, approaching from the side of the pallet where the 6K carriage and shoring is stacked.

(16) Using the ATLAS with10K carriage installed, pick the 6K carriage up and place on stable level ground in suitable area.

(17) Remove shoring from 463L pallet.

F-6. REFERENCES

e. Army Regulations (AR).

55-80	DoD Transportation Engineering Program
55-162	Permits for Oversize, Overweight, or Other Special Military Movements on Public Highways in the United States
55-355	Defense Traffic Management Regulation
70-44	DoD Engineering for Transportability
70-47	Engineering for Transportability

f. Field Manuals (FM).

5-34	Engineer Field Data
5-170	Engineer Reconnaissance
55-15	Transportation Reference Data
55-17	Cargo Specialist's Handbook

g. Supply Bulletins (SB).

700-20	Army Adopted/Other Items Selected for Authorization/List of Reportable Items

h. Technical Bulletins (TB).

55-46-1	Standard Characteristics (Dimensions, Weight, and Cube) for Transportability of Military Vehicles and Other Outside/Overweight Equipment

i. Technical Manuals (TM).

38-250 (AFR 71-4)	Preparing Hazardous Materials for Military Air Shipment
55-500	Watercraft Equipment Characteristics and Data
55-2200-001-12	Transportability Guidance: Application of Blocking, Bracing, and Tiedown Materials for Rail Transport

j. Air Force Manuals.

TO IC-5A-9	Loading Instructions, USAF Series C-5 Aircraft
TO IC-130E-9	Loading Instructions, USAF Series C-130 Aircraft
TO IC-141B-9	Loading Instructions, USAF Series C-141 Aircraft

k. Other Publications.

Code of Federal Regulation, Title 49-Transportation Parts, 107-179 and Title 46-Shipping, Part 146

Available from: Superintendent of Documents
US Government Printing Offices
Washington, DC 20402

Association of American Railroads, *Rules of Governing the Loading of Commodities on Open-Top Cars and Trailer*s
Section No. 1-General rules
Section No. 2-Rules Governing the Loading of Department of Defense Materiel on Open-Top Cars

Available from: Association of American Railroads
50 F Street, NW
Washington, DC 20001-1564

4th Transportation Command Pamphlet 55-2, *Tiedown Guide of Rail Movement*

Available from: 1st Transportation Movement Control Agency
ATTN: AEUTR-MCA-TA
APO New York 09451-4000

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F-7. LOADING RESTRAINT FACTORS

The loading restraint factors (LRF) used for surface and air modes are the “G” (acceleration of gravity) loading factors that can be expected in military transport. The tiedown arrangements shown in the figures are based on the following:

-restraint factors are applied independently in each direction
-restraint load (GVW times the LRF) was resolved into resultant lashing loads, allowing for tiedown angle
-lashing loads are less safe than safe working load (SWL) of the restraint (that is, chain)

Highway:

The Transportation Engineering Agency highway LRFs are:

-0.7 in the forward direction (relative to the transporter)
-0.3 in the aft and vertical directions
-0.1 in the lateral direction

Rail:

The Association of American Railroads recommended rail LRFs are:

-3.0 in the longitudinal direction (relative to the railcar)
-2.0 in the lateral and vertical directions

F-7. LOADING RESTRAINT FACTORS (CONT)

Marine:

The Military Sealift Command (MSC) design LRFs are:

-1.2 in the lateral direction (relative to the ship)
-0.7 in the longitudinal direction
-0.2 in the vertical direction

MSC LRFs are for severe conditions

Actual marine LRFs vary. Marine tiedown restraint depends on the size of the ship (decreasing on larger vessels), the expected sea state to be encountered, and the stow location of a given ship. Generally, the restraint required will increase for locations high and forward (or aft) in the ship. The most severe conditions will occur on exposed "weather decks," where strong wind and wet conditions add to the problem. A ship's crew may require additional lashing on exposed decks. Below-deck locations that are closer to the vessel's center of gravity and rotation will experience less severe motion.

Air:

The USAF aircraft LRFs are:

-3.0 in the forward direction (relative to the aircraft)
-2.0 in the vertical direction
-1.5 in the aft and lateral directions

F-8. ESTIMATING TIEDOWNS

The number of lashings required to safely tie down the ATLAS for highway transport on a typical truck/semitrailer can be estimated in the following manner:

Step 1- Determine the amount of longitudinal restraint needed. (With this method, the required vertical and lateral restraint is covered by the longitudinal factors.)

-The highway loading restraint factor (LRF) is 0.7 (from Para 6-6) in the forward direction:
33,500 (ATLAS GVW) x 0.7 = 23,450 pounds
-The highway LRF is 0.3 in the aft direction:
33,500 x 0.3 = 10,050 pounds

Step 2-Determine the amount of chains needed.

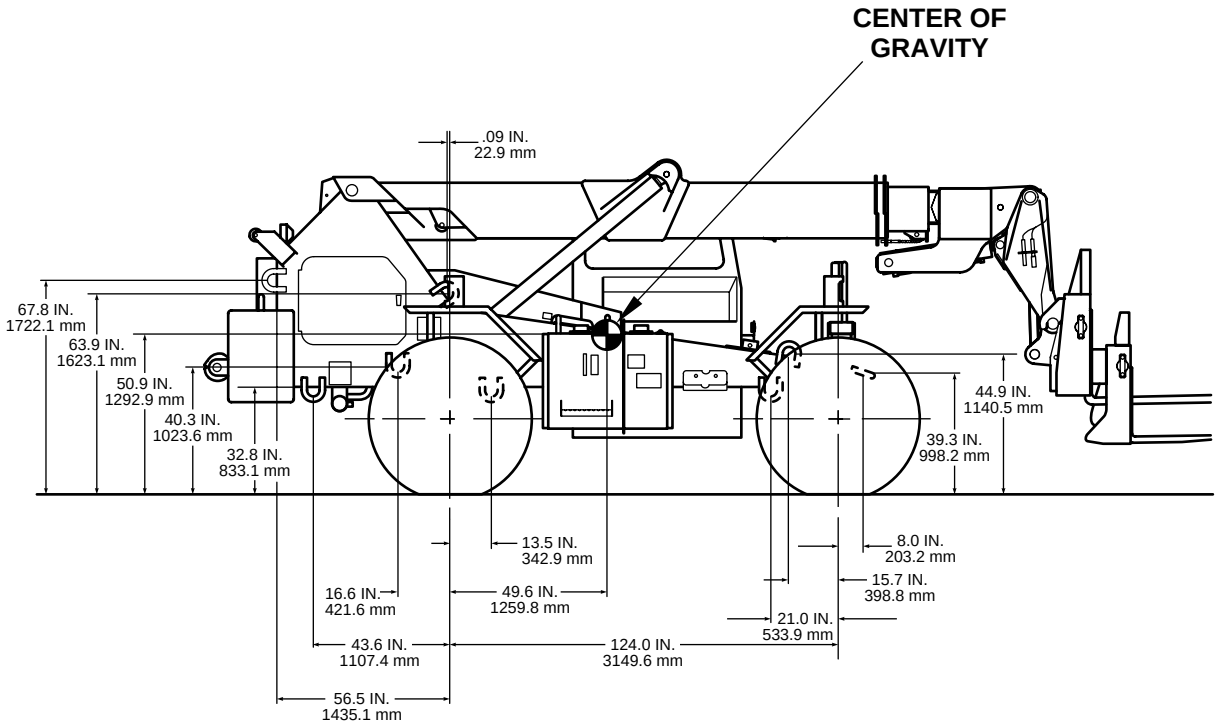
-The angle to semitrailer deck and the angle to the angle to the side are assumed to be 45 degrees.
(cos 45 x cos 45 = 0.5)
-The SWL of the requisite 1/2-in. chain is 13,750:

$$\text{Number of forward loading chains} = \frac{23{,}450}{13{,}750 \times 0.5} = 3.4 \text{ (rounded up to 4)}$$

$$\text{Number of aft loading chains} = \frac{10{,}050}{13{,}750 \times 0.5} = 1.5 \text{ (rounded up to 2)}$$

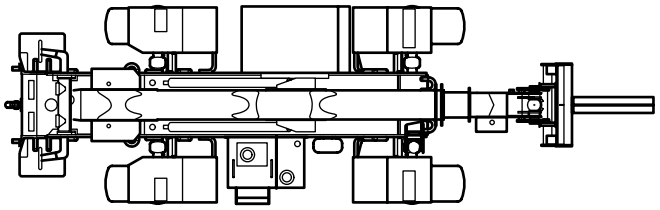
F-9. FIGURES

The following figures present transportability data for the ATLAS.

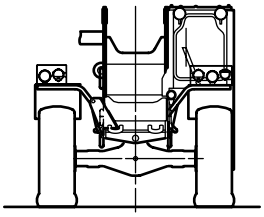


TIEDOWN EYE CAP: 13,300 LBS (6033 KG) MIN.
LIFTEYE CAP: 99,500 LBS (45133 KG)

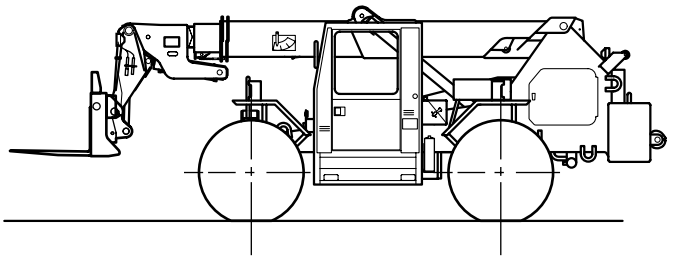
Figure F-1. ATLAS Shipping Data



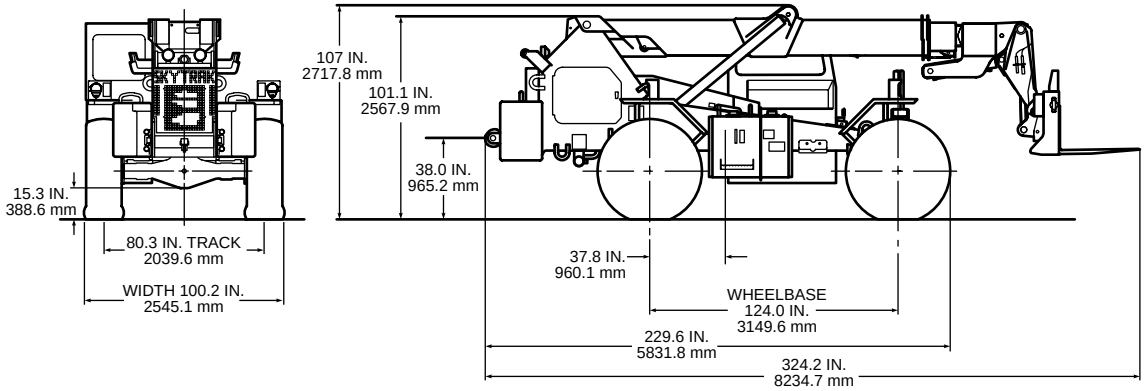
VIEW OF TOP



FRONT VIEW SHOWN W/O BOOM FOR CLARITY



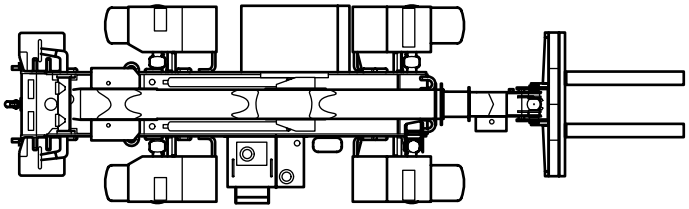
VIEW OF LEFT SIDE



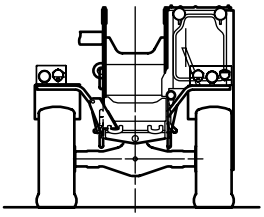
VIEW OF RIGHT SIDE

AXLE & TIRE DATA		
AXLE	**REAR**	**FRONT**
AXLE LOAD	**21,330 LBS 9675 KG**	**9,350 LBS 4241 KG**
LOAD / TIRE	**10,670 LBS 4840 KG**	**4,675 LBS 2121 KG**
FOOTPRINT AREA @ 65 PSI 448 kPa	**175 SQ IN. 1129 CM^2**	**75 SQ IN. 484 CM^2**

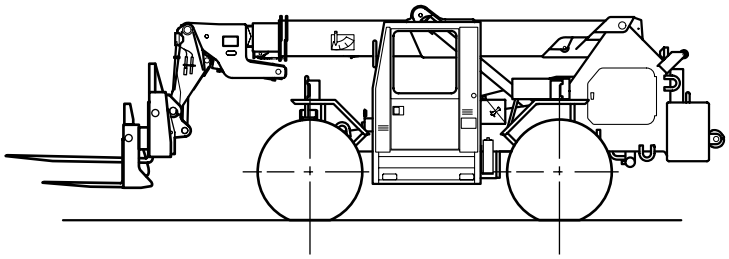
Figure F-2. Vehicle Configuration with 6,000 lb. Carriage



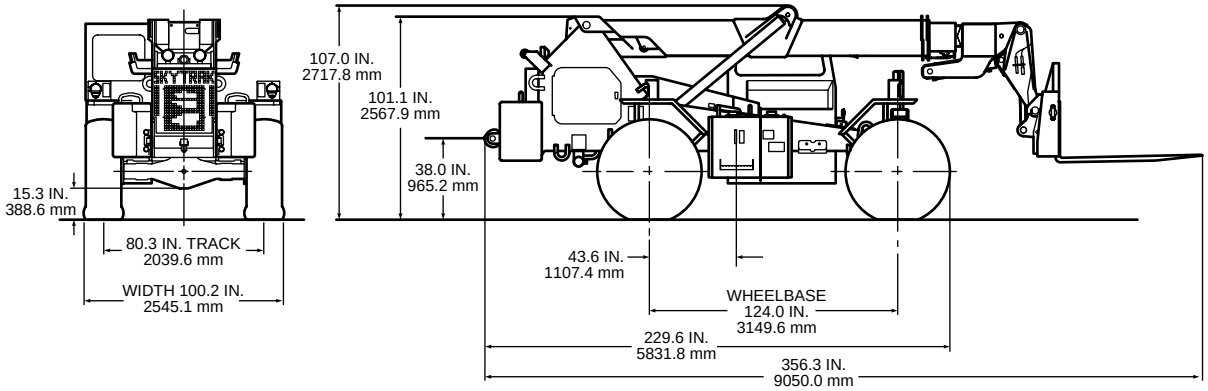
VIEW OF TOP



FRONT VIEW SHOWN W/O BOOM FOR CLARITY



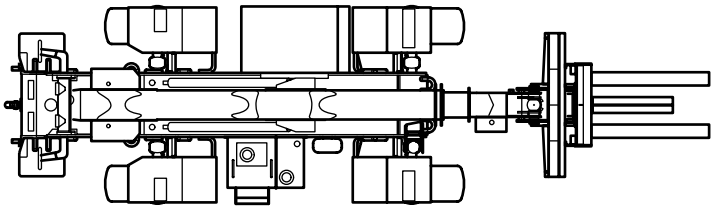
VIEW OF LEFT SIDE



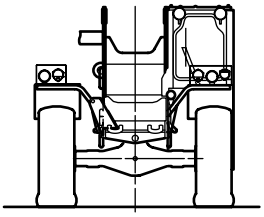
VIEW OF RIGHT SIDE

AXLE & TIRE DATA		
AXLE	**REAR**	**FRONT**
AXLE LOAD	**20,740 LBS 9408 KG**	**11,260 LBS 5108 KG**
LOAD / TIRE	**10,370 LBS 4704 KG**	**5,630 LBS 2554 KG**
FOOTPRINT AREA @ 65 PSI 448 kPa	**170 SQ IN. 1097 CM^2**	**92 SQ IN. 594 CM^2**

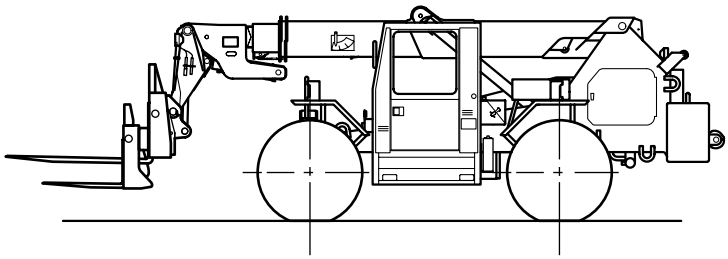
Figure F-3. Vehicle Configuration with 10,000 lb. Carriage



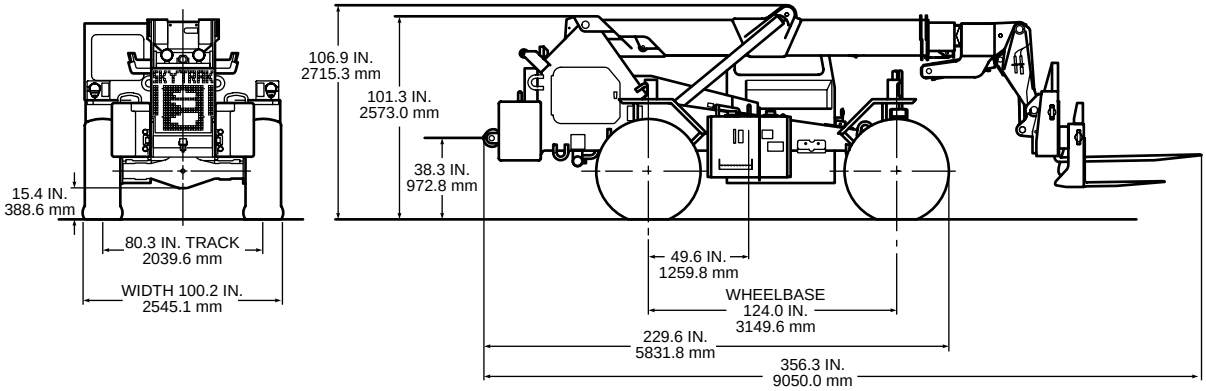
VIEW OF TOP



FRONT VIEW SHOWN W/O BOOM FOR CLARITY



VIEW OF LEFT SIDE



VIEW OF RIGHT SIDE

AXLE & TIRE DATA		
AXLE	**REAR**	**FRONT**
AXLE LOAD	**19,900 LBS 9027 KG**	**13,280 LBS 6024 KG**
LOAD / TIRE	**9,950 LBS 4513 KG**	**6,640 LBS 3012 KG**
FOOTPRINT AREA @ 65 PSI 448 kPa	**165 SQ IN. 1065 CM^2**	**110 SQ IN. 710 CM^2**

Figure F-4. Vehicle Configuration with Both Carriages

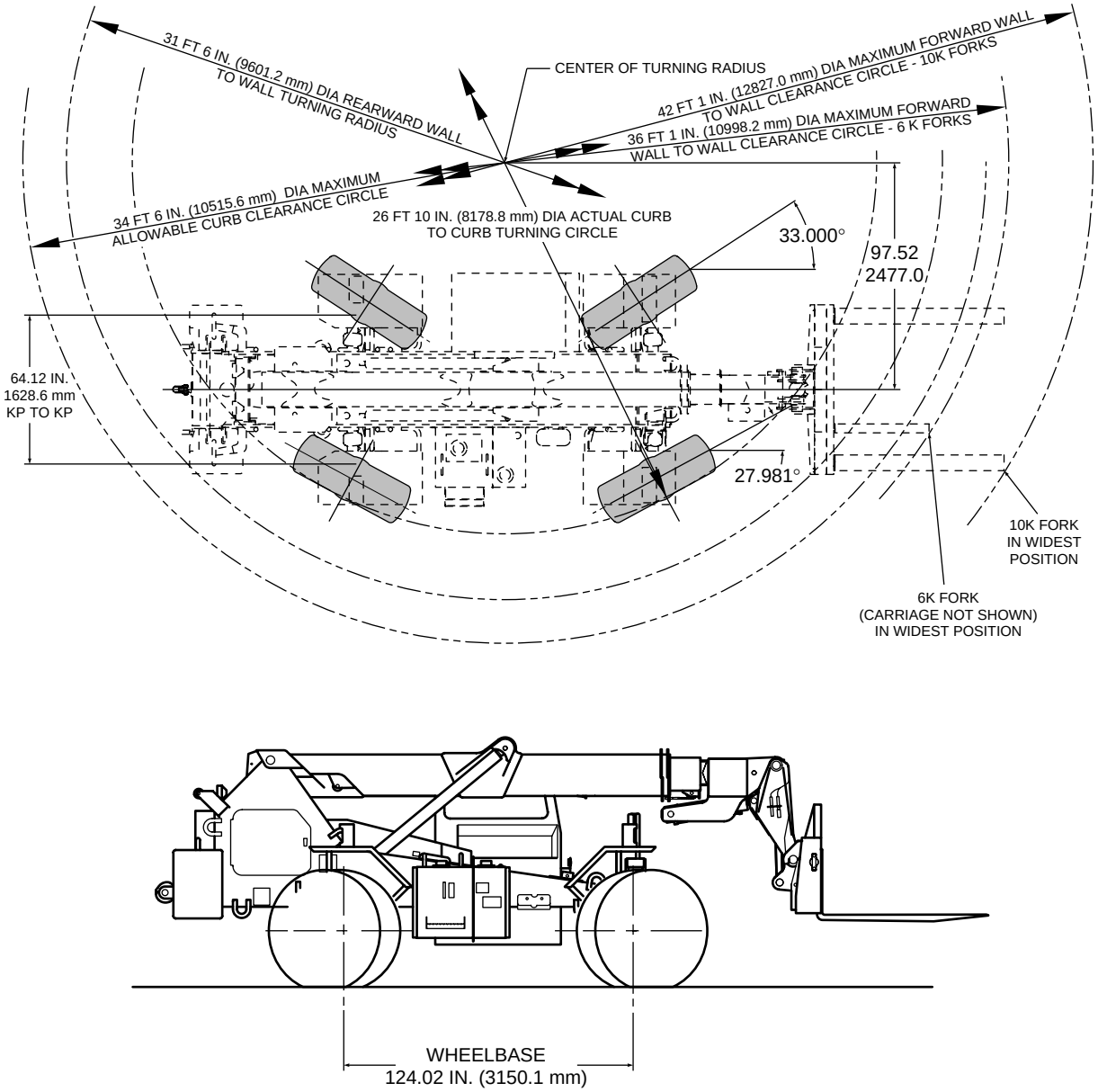

31 FT 6 IN. (9601.2 mm) DIA REARWARD WALL TO WALL TURNING RADIUS
CENTER OF TURNING RADIUS
42 FT 1 IN. (12827.0 mm) DIA MAXIMUM FORWARD WALL TO WALL CLEARANCE CIRCLE - 10K FORKS
36 FT 1 IN. (10998.2 mm) DIA MAXIMUM FORWARD WALL TO WALL CLEARANCE CIRCLE - 6 K FORKS
34 FT 6 IN. (10515.6 mm) DIA MAXIMUM ALLOWABLE CURB CLEARANCE CIRCLE
26 FT 10 IN. (8178.8 mm) DIA ACTUAL CURB TO CURB TURNING CIRCLE
33.000°
97.52
2477.0
64.12 IN.
1628.6 mm
KP TO KP
27.981°
10K FORK IN WIDEST POSITION
6K FORK (CARRIAGE NOT SHOWN) IN WIDEST POSITION
WHEELBASE
124.02 IN. (3150.1 mm)

Figure F-5. ATLAS Steering Geometry

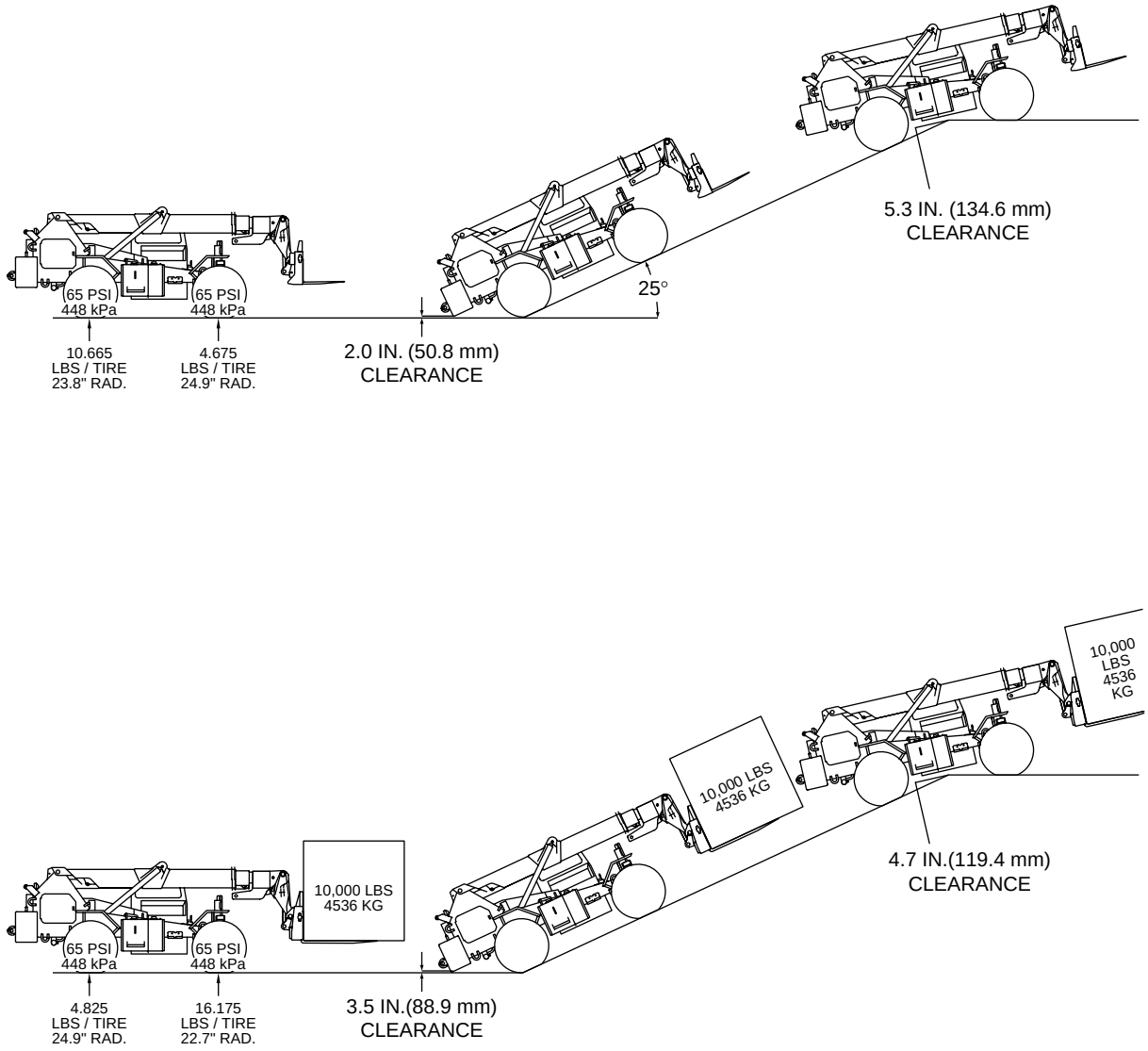
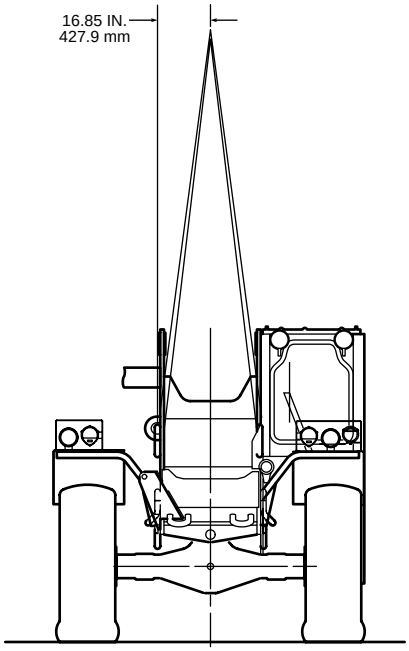


Figure F-6. Approach and Departure Ramp Clearance



FRONT VIEW SHOWN W/O BOOM FOR CLARITY

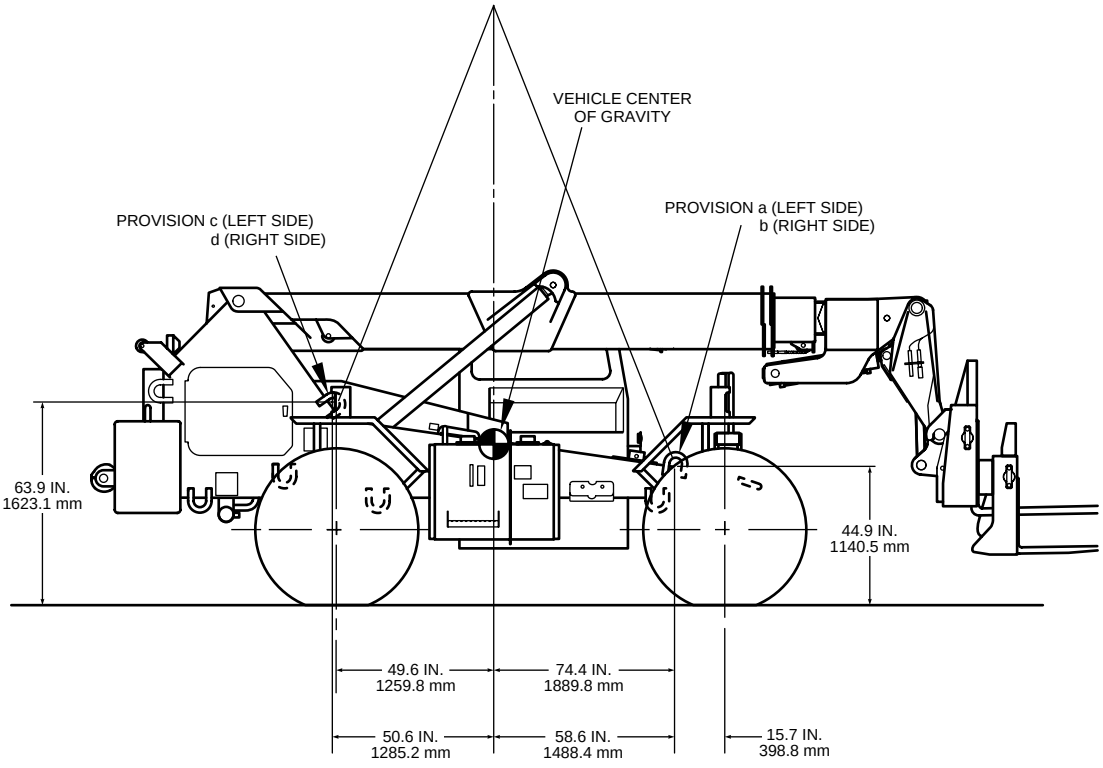


Figure F-7. Slinging Provision Configuration

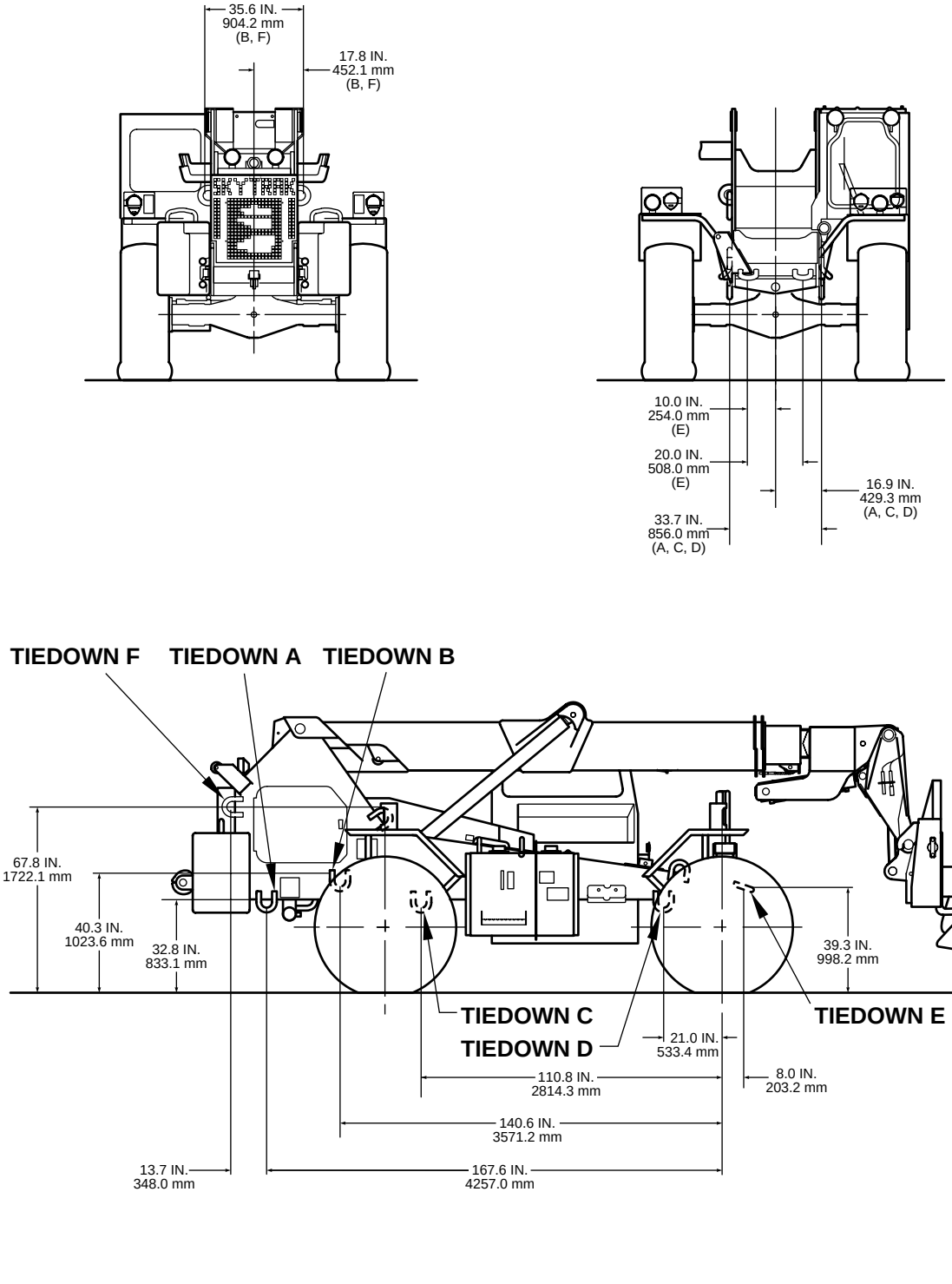


Figure F-8. Tiedown Provision Location

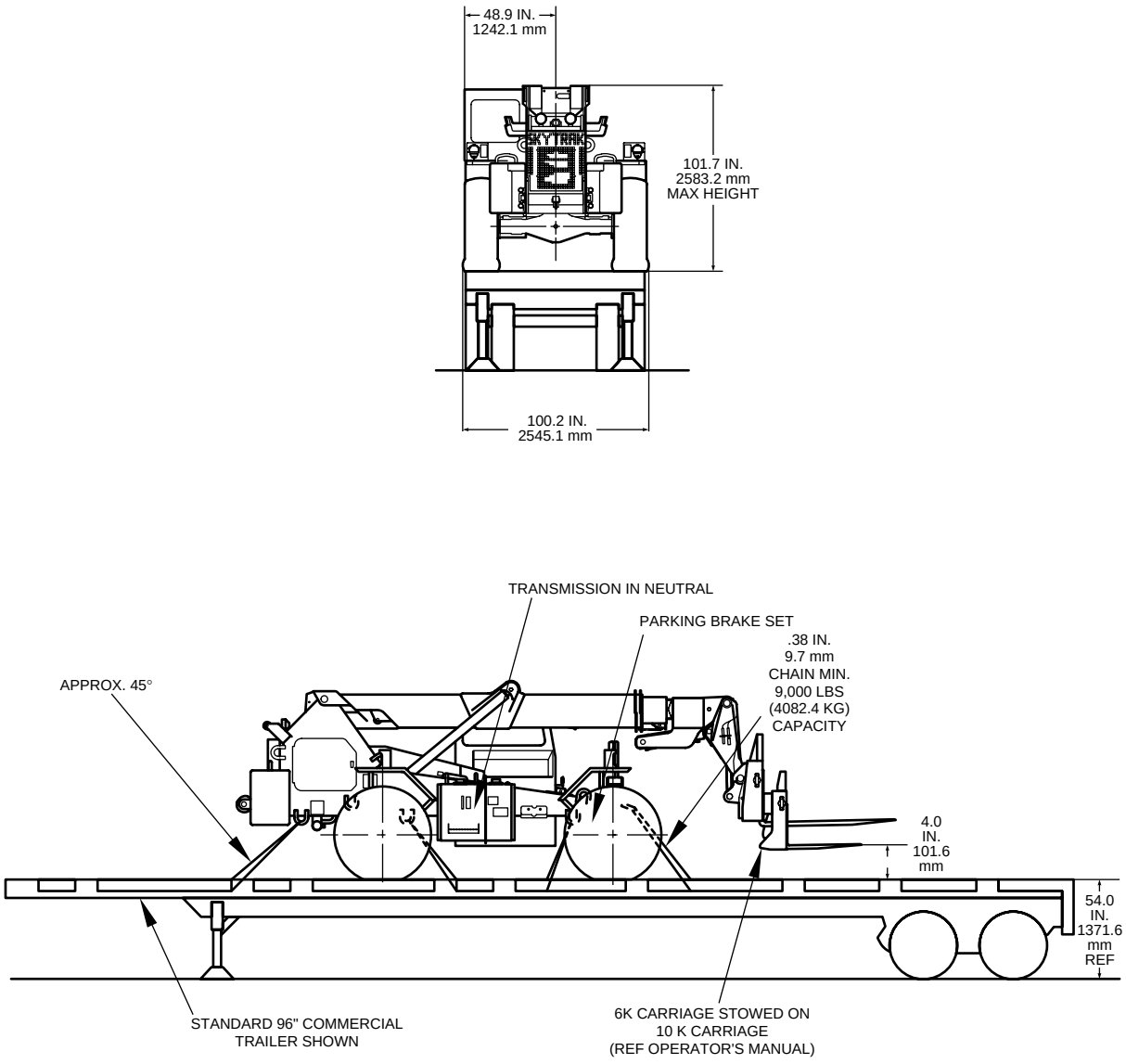
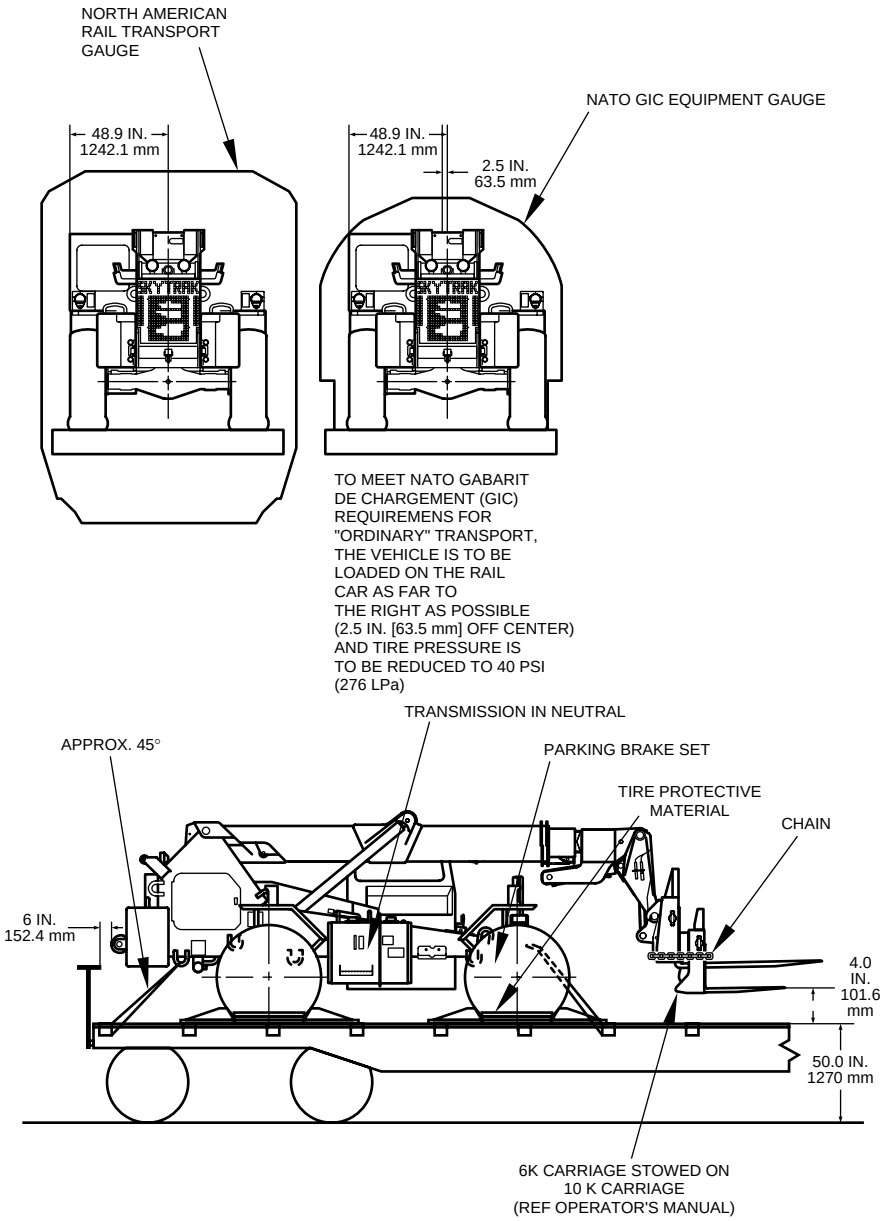
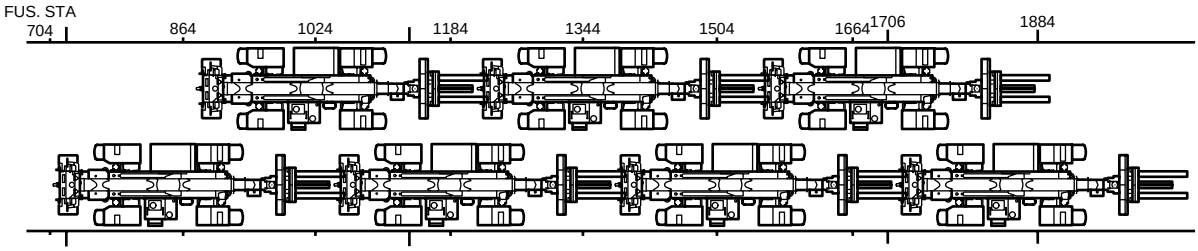


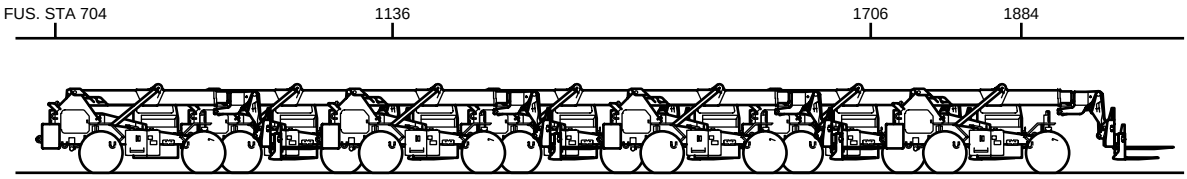
Figure F-9. Truck Transportability



AXLE & TIRE DATA		
AXLE	**REAR**	**FRONT**
AXLE LOAD	**19,900 LBS 9027 KG**	**13,280 LBS 6024 KG**
LOAD / TIRE	**9,950 LBS 4513 KG**	**6,640 LBS 3012 KG**
FOOTPRINT AREA @ 40 PSI 276 kPa	**217 SQ IN. 1400 CM^2**	**146 SQ IN. 942 CM^2**
FOOTPRINT AREA @ 65 PSI 448 kPa	**165 SQ IN. 1065 CM^2**	**110 SQ IN. 710 CM^2**

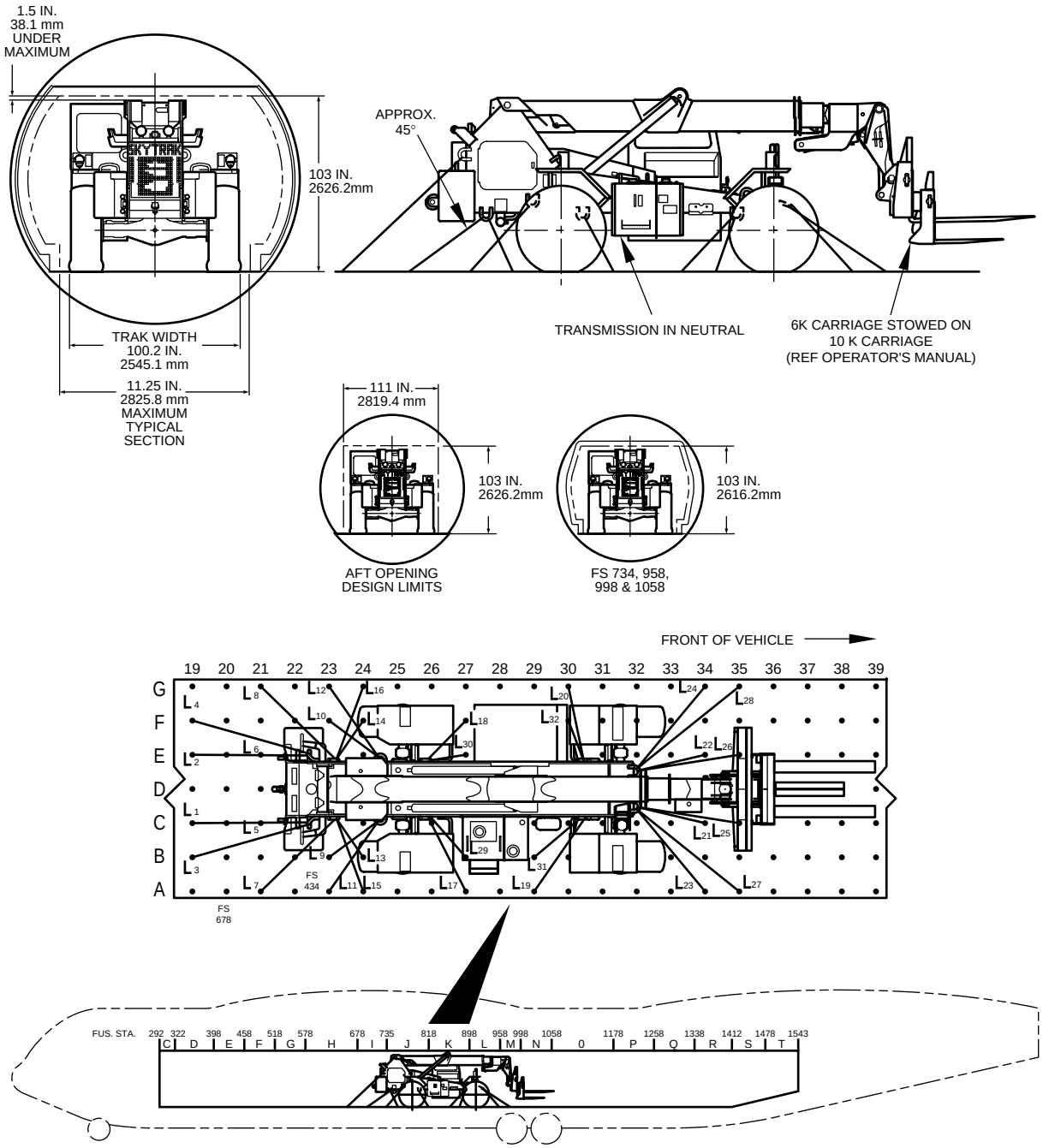
Figure F-10. Rail Transportability and GIC Clearance





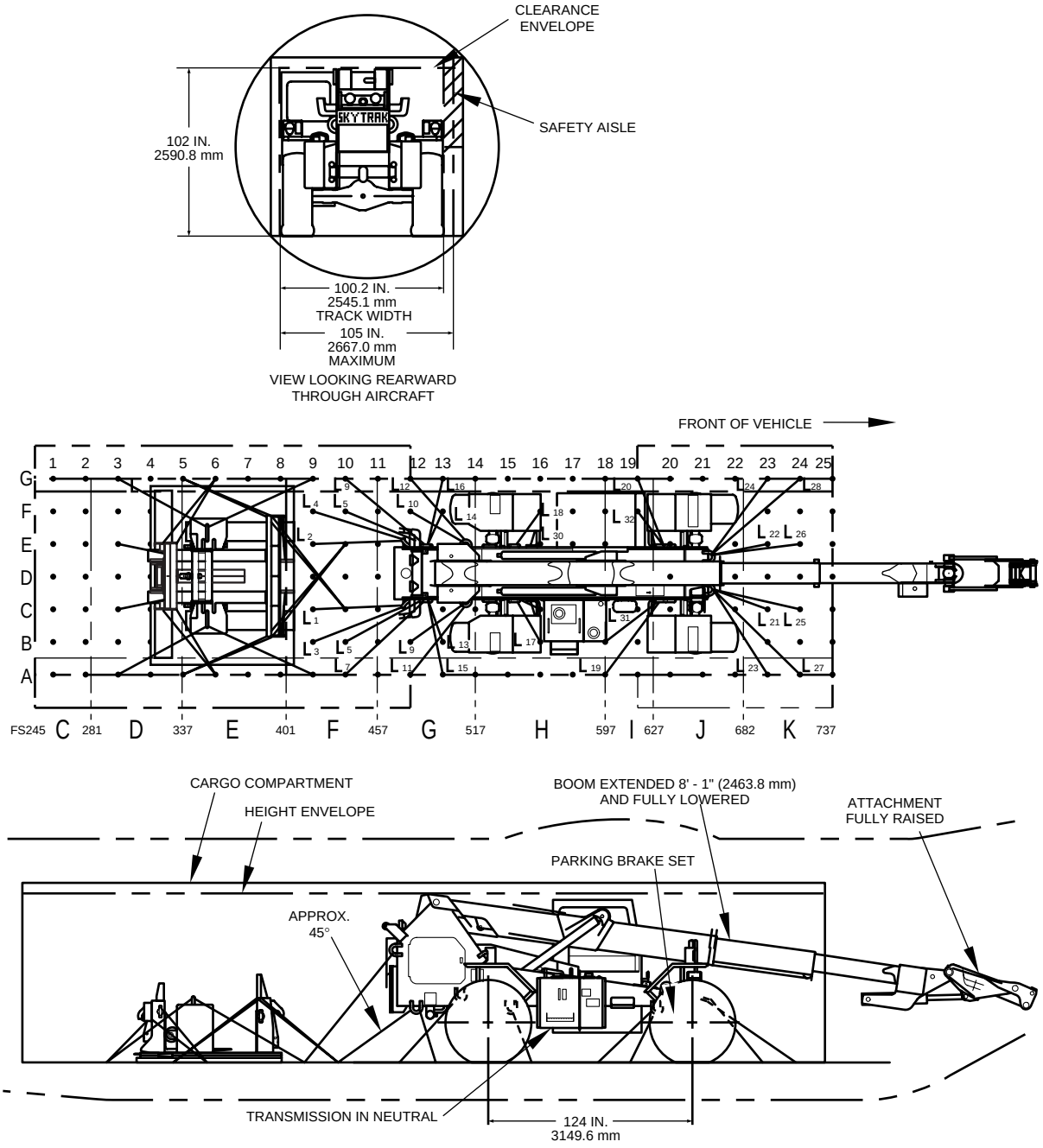
AXLE & TIRE DATA		
AXLE	**REAR**	**FRONT**
AXLE LOAD	**19,900 LBS 9027 KG**	**13,280 LBS 6024 KG**
LOAD / TIRE	**9,950 LBS 4513 KG**	**6,640 LBS 3012 KG**
FOOTPRINT AREA @ 65 PSI 448 kPa	**165 SQ IN. 1065 CM²**	**110 SQ IN. 710 CM²**

Figure F-11. Air Transport, C-5A Configuration



AXLE & TIRE DATA		
AXLE	**REAR**	**FRONT**
AXLE LOAD	**19,900 LBS 9027.0 KG**	**13,280 LBS 6024.0 KG**
LOAD / TIRE	**9,950 LBS 4513.0 KG**	**6,640 LBS 3012 KG**
FOOTPRINT AREA @ 65 PSI 448 kPa	**165 SQ IN. 1064.5 CM²**	**110 SQ IN. 709.7 CM²**

Figure F-12. Air Transport, C141 Tiedowns



463L PALLET DATA	
463L PALLET	290 LBS 131.5 KG
10,000 LB FORK CARRIAGE WEIGHT	2,520 LBS 1143.1 KG
6,000 LB FORK CARRIAGE WEIGHT	1,180 LBS 535.2 KG
COUNTERWEIGHT ASSEMBLY WEIGHT	5,800 LBS 2630.9 KG
TOTAL	9,800 LBS 4445.3 KG

AXLE & TIRE DATA		
AXLE	REAR	FRONT
AXLE LOAD	12,980 LBS 5888 KG	11,420 LBS 5180 KG
LOAD / TIRE	6,490 LBS 2944 KG	5,710 LBS 2590 KG
FOOTPRINT AREA @ 25 PSI 172 kPa	204 SQ IN. 1316 CM²	178 SQ IN. 1148 CM²

Figure F-13. Air Transport, C-130 Configuration

ALPHABETICAL INDEX

Subject, Page

A

Abbreviations, 1-3
Additional Authorization List, C-1
Air Cleaner - Service, 3-10
Arctic Kit Operation, 2-67

B

Basic Issue Items (BII) List, B-1

C

Capabilities, 1-3
Characteristics, 1-3
Components of End Item (COEI) B-1
Components, Location and Description, 1-4
Controls and Indicators, 2-1
Corrosion Prevention and Control (CPC), 1-2
Counterweights Installation, 2-48

D

Decals, 2-61
Decontamination Unit, 2-60
Description of Major Components, 1-4
Destruction of Army Material to Prevent Enemy Use, 1-2
Dust or Sandstorms Operation, 2-74

E

Electrical System, 1-13
Emergency Boom Operations, 2-81
Engine
- Cranks but will not Start, 3-2
- Low Oil Pressure, 3-4
- Misfires, 3-3
- Overheats, 3-4
- Starting, 2-32
- Stopping, 2-44
- Will not Crank, 3-2

Engine Lubrication and Cooling Systems, 1-9
Engine Oil Sampling Valve - Service, 3-7
Equipment Characteristics, Capabilities, and Features, 1-3
Equipment Data, 1-6
Equipment Improvement Recommendations (EIR'S), Reporting, 1-2

Subject, Page

E (Cont)

Equipment Improvement Report and Maintenance Digest (EIR MD), 1-2
Expendable/Durable Supplies and Materials List, D-1
Extreme Cold Operation, 2-64
Extreme Dry Heat Operation, 2-63
Extreme Moist Heat Operation, 2-63

F

Features, 1-3
Fording, 2-74
Forklift
- Moving, 2-36
- Steering, 2-42
- Stopping, 2-44

Fuel System, 1-8
Fuel/Water Separator, 3-15

G

General Information
- Abbreviations, 1-3
- Corrosion Prevention and Control (CPC), 1-2
- Destruction of Army Material to Prevent Enemy Use, 1-2
- Equipment Improvement Report and Maintenance Digest (EIR MD), 1-2
- Maintenance Forms and Records, 1-2
- Reporting Equipment Improvement Recommendations (EIR'S), 1-2
- Scope, 1-1

H

Hydraulic Oil Sampling Valve - Service, 3-9
Hydraulic System, 1-14

L

Load Rating Chart, E-1
Loading and Unloading Ammunition and Other Pallets from a Container or Trailer, 2-57
Location of Major Components, 1-4
Lubrication Instructions, 2-18, 3-1

ALPHABETICAL INDEX (CONT)

Subject, Page

M

Maintenance Forms and Records, 1-2
Major Components, Location and Description of, 1-4

N

New Vehicle Break-in, 2-31

O

Operation Procedures
- Decals and Warning Plates, 2-61
- Decontamination Unit, 2-60
- General, 2-31
- Highway Transport, 2-53
- Installing Counterweights, 2-48
- Loading and Unloading Ammunition and Other Pallets from Container or Trailer, 2-57
- Moving the Forklift, 2-36
- New Vehicle Break-in, 2-31
- Removing Counterweights, 2-48
- Rifle Mount, 2-59
- Roading the 6K Fork Carriage, 2-47
- Starting the Engine, 2-32
- Steering the Forklift, 2-42
- Stopping the Engine, 2-44
- Stopping the Forklift, 2-44

Operation Under Unusual Conditions
- Emergency Boom Operations, 2-81
- Fording, 2-74
- General, 2-63
- In Dust or Sandstorms, 2-74
- In Extreme Cold, 2-64
- In Extreme Dry Heat, 2-63
- In Extreme Moist Heat, 2-63
- In Salt Water Areas, 2-74
- Rear Window Emergency Exit, 2-88
- Slave Starting, 2-76
- Towing other Vehicles, 2-77

Subject, Page

O (Cont)

Operation Under Unusual Conditions (Cont)
- Towing the ATLAS, 2-78
- With Arctic Kit, 2-67

Operator Maintenance Procedures
- Air Cleaner, 3-10
- Engine Oil Sampling Valve, 3-7
- Fuel/Water Separator, 3-15
- Hydraulic Oil Sampling Valve, 3-9
- Introduction, 3-7
- Radiator, 3-14
- Transmission Oil Sampling Valve, 3-8

P

Parking Brake, 1-12
PMCS Procedures, 2-16
Preventive Maintenance
- General, 2-16
- Lubrication Instructions, 2-18
- PMCS Procedures, 2-16

Principles of Operation
- Electrical System, 1-13
- Engine Lubrication and Cooling Systems, 1-9
- Fuel System, 1-8
- General, 1-7
- Hydraulic System, 1-14
- Steering and Brake System, 1-12
- Transmission Lubrication and Cooling Systems, 1-11

Publication Indexes and General References, A-1
Publications, Other, A-1

R

Radiator - Service, 3-14
Rear Window Emergency Exit, 2-88
Reporting Equipment Improvement Recommendations (EIR'S), 1-2
Rifle Mount, 2-59

ALPHABETICAL INDEX (CONT)

Subject, Page

S

Salt Water Areas Operation, 2-74
Scope, 1-1
Slave Starting, 2-76
Steering and Brake System, 1-12

T

Towing other Vehicles, 2-77
Towing the ATLAS, 2-78
Transmission Lubrication and Cooling Systems, 1-11

Subject, Page

T (Cont)

Transmission Oil Sampling Valve - Service, 3-8
Transportability Instructions, F-1
Troubleshooting Procedures
  General, 3-1
  Troubleshooting, 3-1

W

Warning Plates, 2-61
Water Separator-Service, 3-15

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THE METRIC SYSTEM AND EQUIVALENTS

LINEAR MEASURE

1 Centimeter=10 Millimeters=0.01 Meters=0.3937 Inches
1 Meter=100 Centimeters=1000 Millimeters=39.37 Inches
1 Kilometer=1000 Meters=0.621 Miles

WEIGHTS

1 Gram=0.001 Kilograms=1000 Milligrams=0.035 Ounces
1 Kilogram=1000 Grams=2.2 Lb
1 Metric Ton=1000 Kilograms=1 Megagram=1.1 Short Tons

LIQUID MEASURE

1 Milliliter=0.001 Liters=0.0338 Fluid Ounces
1 Liter=1000 Milliliters=33.82 Fluid Ounces

SQUARE MEASURE

1 Sq Centimeter=100 Sq Millimeters=0.155 Sq Inches
1 Sq Meter=10,000 Sq Centimeters=10.76 Sq Feet
1 Sq Kilometer=1,000,000 Sq Meters=0.386 Sq Miles

CUBIC MEASURE

1 Cu Centimeter=1000 Cu Millimeters=0.06 Cu Inches
1 Cu Meter=1,000,000 Cu Centimeters=35.31 Cu Feet

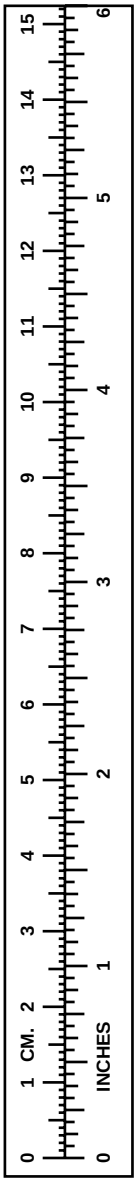
TEMPERATURE

5/9 (°F – 32) = °C
212° Fahrenheit is equivalent to 100° Celsius
90° Fahrenheit is equivalent to 32.2° Celsius
32° Fahrenheit is equivalent to 0° Celsius
9/5 (C° + 32) = F°

APPROXIMATE CONVERSION FACTORS

TO CHANGE	TO	MULTIPLY BY
Inches	Centimeters	2.540
Feet	Meters	0.305
Yards	Meters	0.914
Miles	Kilometers	1.609
Squares Inches	Square Centimeters	6.451
Square Feet	Square Meters	0.093
Square Yards	Square Meters	0.836
Square Miles	Square Kilometers	2.590
Acres	Square Hectometers	0.405
Cubic Feet	Cubic Meters	0.028
Cubic Yards	Cubic Meters	0.765
Fluid Ounces	Milliliters	29.573
Pints	Liters	0.473
Quarts	Liters	0.946
Gallons	Liters	3.785
Ounces	Grams	28.349
Pounds	Kilograms	0.454
Short Tons	Metric Tons	0.907
Pound-Feet	Newton-Meters	1.356
Pounds/Sq Inch	Kilopascals	6.895
Miles per Gallon	Kilometers per Liter	0.425
Miles per Hour	Kilometers per Hour	1.609

TO CHANGE	TO	MULTIPLY BY
Centimeters	Inches	0.394
Meters	Feet	3.280
Meters	Yards	1.094
Kilometers	Miles	0.621
Sq Centimeters	Square Inches	0.155
Square Meters	Square Feet	10.764
Square Meters	Square Yards	1.196
Square Kilometers	Square Miles	0.386
Sq Hectometers	Acres	2.471
Cubic Meters	Cubic Feet	35.315
Cubic Meters	Cubic Yards	1.308
Milliliters	Fluid Ounces	0.034
Liters	Pints	2.113
Liters	Quarts	1.057
Liters	Gallons	0.264
Grams	Ounces	0.035
Kilograms	Pounds	2.205
Metric Tons	Short Tons	1.102
Newton-Meters	Pound-Feet	0.738
Kilopascals	Pounds per Sq Inch	0.145
Km per Liter	Miles per Gallon	2.354
Km per Hour	Miles per Hour	0.621



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